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CS8030

Test System for Telephonometry

Ver.2.0.1.0

11/06

CS STRUMENTAZIONE ELETTRONICA Srl

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Questa Apparecchiatura é conforme alle seguenti direttive CEE:
- 73/23/CEE del 19/02/73 relativa alla bassa tensione;
- 89/336/CEE del 03/05/89 relativa alla compatibilità elettromagnetica.

This appliance complies with the following E.E.C. Directives:
- 73/23/CEE of 19.2.73 (Low Voltage Directive) and subsequent modifications;
- 89/336/CEE of 3.5.89 (Electromagnetic Compatibility Directive) and subsequent modification.

Cet appareil est conforme aux Directives Communautaires suivantes:
- 73/23/CEE du 19/02/73 (Basse Tension) et modifications successives;
- 89/336/CEE du 03/05/89 (Compatibilité Electromagnétique) et modifications successives.

Dieses Gerät entspricht den folgenden EG-Richtlinien:
- 73/23/EWG vom 19.02.1973 Niederspannungsrichtlinie;
- 89/336/EWG vom 03.05.1989 (einschließlich Änderungsrichtlinie 92/31/EWG) - EMV-Richtlinie.

Dit toestel voldoet aan de EG-richtlijn 89/336/EEG, 73/23/EEG.

Esta máquina marcada CE cumple con las directivas:
- 73/23/CEE sobre material eléctrico destinado a utilizarse con determinados limites de tensión;
- 89/336/CEE sobre compatibilidad electromagnética.

Esta maquina marcada CE cumpre as directivas:
- 73/23/CEE sobre o material eléctrico destinado a ser utilizado com determinados limites de tensão;
- 89/336/CEE sobra compatibilidade electromagnética.

Dette apparat oppfyller kravene i EU-direktivet 89/336/EEG, 73/23/EEG.

Dette apparat opfylder kravene i EF-direktiv 89/336/EØF, 73/23/EØF.

Tämä laite täyttää EN:n asettamat määräykset 89/336/EU, 73/23/EU.

Denna apparat uppfyller kraven i EG-direktivet 89/336/EEG, 73/23/EEG.

Declaration of Conformity

Manufacturer's Name:	CS Strumentazione Elettronica S.r.l.
Manufacturer's Address:	Via Riva di Trento, 5 20139 MILANO ITALY

The manufacturer hereby declares that the product

Product Name:	Test System for Telephonometry
Model:	CS8030
Product Options:	All
Accessories:	AC-3, AC-3VV, AC-4, PH-18 Electromagnetic compatibility requires CS X109-2 shielded cable to connect CS8030 to AC-3, AC-3VV, AC-4, CS2036, CS2040.

conforms to the following standards or other normative documents:

Electromagnetic Emissions: (by Council Directive 89/336/EEC)	EN 55022: 1998	30 ÷ 1000 MHz - Enclosure
		0.15 ÷ 30 MHz - AC Power
	EN 61000-3-2: 1995 +A1/A2: 1998	
		0.1 ÷ 2 KHz - AC Power
	EN 61000-3-3: 1995	Voltage Fluctuations - AC Power
Electromagnetic Immunity: (by Council Directive 89/336/EEC)	EN 55024: 1998	
	EN 61000-4-2: 1995	Electrostatic. Discharge - Enclosure
	EN 61000-4-3: 1995	80 ÷ 1000 MHz - Enclosure
	EN 61000-4-4: 1995	5 KHz Transient - Signal/AC Power
	EN 61000-4-5: 1995	Surges Pulse - AC Power
	EN 61000-4-6: 1996	0.15 ÷ 80 MHz - Signal/AC Power
	EN 61000-4-8: 1994	50 Hz-Magnetic Field - Enclosure
	EN 61000-4-11: 1994	Interruptions - AC Power
Safety: (by Council Directive 73/23/EEC)	EN 60950: 1992 +A1: 1993 +A2: 1993 +A3: 1995 +A4: 1997 +All: 1997	

Supplementary Information

Calibration Center:	42/E – NEMKO S.p.A.
Test Report No:	EMC/Safety 1393-1/00

When and Where Issued
Date :
MILANO - Italy

Marks of Compliance

CE

Gianluca Cardin
Quality Manager

CATEGORIA DI INSTALLAZIONE II, SECONDO LE NORME EN 61010

INSTALLATION GROUP II, ACCORDING TO RULES EN 61010

GROUPE DE INSTALLATION II, SELON LES SPECIFICATIONS EN 61010

Collection of typical characteristics and measuring accuracy for quick reference

CS8030 Characteristics

Generals

Main characteristics

Size	W = 482mm with handle D = 500mm with handle H = 190mm
Weight	10Kg.
Supply voltage power	 180÷264Vac or 90÷132Vac 48÷63Hz 50VA @ 230V-50Hz
Environment	see §**2.4**

Electric characteristics of subset 1 ÷ subset 4 Input

• Impedance	user selectable by binding posts
• Measurement range	-50 ÷ +20 dBV peak

Electric characteristics of subset 1 ÷ subset 4 Output

• Impedance	user selectable by binding posts
• Output level	-40÷ 11dBV e.m.f.
• Output current	max. : 12 mA @10V peak 30 mA @ 3V peak

Electric characteristics of din 1 ÷ din4 Input

• Impedance	600Ω unbalanced (ground reference)
• Measurement range	-50 ÷ +20 dBV peak

Electric characteristics of din 1 ÷ din4 Output

• Impedance	600Ω unbalanced (ground reference)
• Output level	-40÷ 11dBV e.m.f.

SPEECH TESTS

Main characteristics

• Stimuli range for acoustical tests for electrical tests	 -34.5 ÷ +13.8dB$_{Pa}$ or OFF step .1dB -40 ÷ +11dB$_{V\ e.m.f.}$ or OFF step .1dB

- Receiving, Sending, Sidetone

• Standards	ITU (CCITT) P79 – BRITISH – – IEEE661/269 – OREM A/B/CH – AUSTRALIAN –
• Test signals –frequency density –frequency range –signal types	 1/3 octave or 1/12 octave 200 ÷ 4000Hz or 100 ÷ 8000Hz LINEAR, SPEECH, SFERT
• Loudness Rating, Objective Reference Equivalent RMS test - measure resolution	 0.1 dB
• Accuracy	± 0.5dB included electroacoustic devices after calibration
• Averaging	programmable 1÷16 samples
• Measurement time	Min. : 0.75s (1/3oct. – 0.2÷4KHz – no Windows open no sample average) Max. : 3.4s (1/12oct. – 0.1÷8KHz – all Windows open 16 samples averages)

- Return Loss

• Echo Return Loss (E.R.L.) - resolution - accuracy	 0.1dB ±0.3dB in the range 0 ÷ 40dB
• Test signals –frequency density –frequency range	 1/3 octave or 1/12 octave 200 ÷ 4000Hz or 100 ÷ 8000Hz
• Measurement time	Min. : 0.75s (1/3oct. – 0.2÷4KHz – no Windows open no sample average) Max. : 3.4s (1/12oct. – 0.1÷8KHz – all Windows open 16 samples averages)

DISTORTION

• frequency resolution	10 Hz
• Measurement time	Min. : 1.1s (0.2÷4KHz –no Windows – no average) Max. : 4.5s (0.1÷8KHz –all Windows –average 16)

CS8030 USER MANUAL

DESCRIPTION OF CONTENTS

Chapter 1
PRODUCT PRESENTATION

1.1 Introduction 1
1.2 Configuration 2
1.2.1 Options 3
1.3 General Description 3
1.3.1 Programmability 4
1.3.2 Operation 5

Chapter 2
INSTALLATION PLANT CHOICE AND INSTALLATION

2.1 Installation Plant selection 1
2.2 Environment 1
2.2.1 Floor 1
2.2.2 Sizes and Placement 1
2.3 Power supply 2
2.3.1 Electrical Network Requirements 2
2.3.2 Electric Plant fulfilment 2
2.4 Environmental Conditions 3
2.4.1 Temperature and Humidity 3
2.5 Environmental Noise 3
2.6 Installation 4

Chapter 3
HARDWARE

3.1 Main characteristics 1
3.2 Front Panel 2
3.3 Rear Panel 2
3.3.1 Power supply 2
3.3.2 I/O Section 3
3.3.2.1 Feeding Bridge (Optional) 5
3.3.3 Peripheral Section 6
3.4 Internal 7

Chapter 4
FUNCTIONS AND COMMANDS

4.1 Generals 1
4.1.1 Shortcuts 5
4.2 File Menu 6
4.3 Edit Menu 7
4.4 Tests Menu 8
4.5 Printer Menu 8
4.6 Execution Menu 9
4.7 SetUp Menu 10
4.8 Calibration Menu 10
4.9 Collection/Recording Menu 10
4.10 Window Menu 11
4.11 Tools Menu 12
4.12 Help Menu 12

Chapter 5
TEST ORGANIZATION

5.1 Test Types 1
5.2 Test Program 1
5.3 Auxiliary Functions 3
5.3.1 Comment 3
5.3.2 Message 3
5.3.3 AC-4 Control 4
5.3.4 Feeding Bridge 5
5.4 Attributes 6
5.5 Controls 6
5.6 Program preparation and execution 7

Chapter 6
CS8030 – ENVIRONMENT OPTIONS

6.1 Environment Options 1
6.1.1 Settings 2
6.1.2 Behaviors 4
6.1.3 Start Up 5
6.1.4 Graphic 7
6.1.5 Din Port 8
6.1.6 Printer 10
6.1.7 IEEE-488 11

Chapter 7
ACOUSTIC TESTS – SPEECH

7.1 Generals 1
7.1.1 Telephonometric Measure 1
7.2 Principles of measure 2
7.2.1 Measuring method for "Speech" Test 3
7.3 Insertion of "Speech" Test 6
7.3.1 Sending Test 6
7.3.2 Receiving Test 11
7.3.3 Side Tone Test 16
7.3.4 Over-All Test 21
7.3.5 TE Noise Test 26
7.3.5.1 Sending TE Noise Test 27
7.3.5.2 Receiving TE Noise Test 28
7.3.5.3 Side Tone TE Noise Test 29
7.3.6 Hearing Aids Test 30
7.4 Acceptance Mask setting 34
7.5 Viewing results 35

Chapter 8
DISTORTION TESTS

8.1 Distortion measures 1
8.1.1 Principles of measure 1
8.2 Insertion of "Distortion" Test 2
8.2.1 Sending Test 2
8.2.2 Receiving Test 5
8.2.3 Side Tone Test 8
8.2.4 Over-All Test 11

Chapter 9
ELECTRICAL TESTS

9.1 Return loss measures 1
9.1.1 Principles of measure 1
9.2 Insertion of "Return Loss" Test 3

Chapter 10
COLLECTION/RECORDING&PRINT

10.1 Generals 1
10.2 Collection and Recording 1
10.2.1 Collection for Report 2
10.2.2 Recording for View 3
10.2.3 Edit Collection/Recording 5
10.2.4 End Collection/Recording 5

10.2.5 View Data File....6
10.2.6 End View Data File....6
10.2.7 Test Condition....6
10.2.8 Import Collection/Recording....7
10.2.9 Export Collection/Recording....7
10.2.10 Convert Collection/Recording....7
10.3 Print....9
10.3.1 Setup....9
10.3.2 Program list....10
10.3.3 Selected tests list....10
10.3.4 Program Parameters....11
10.3.5 Selected tests parameters....11
10.3.6 Results....12
10.3.7 Report....12
10.3.8 Verdict....13
10.3.9 Calibration Chart....14

Chapter 11
MAINTENANCE

11.1 Generals....1
11.2 Calibration and Functional checks....2
11.2.1 Preliminary....2
11.2.2 Floppy Disk drive check....2
11.2.3 Electrical checks....2
11.2.4 DIN connectors check....3
11.2.5 SUBSET connectors check....3
11.2.6 COM port check....3
11.2.7 IEEE488 port check....4
11.2.8 PRINTER port check....4
11.2.9 NETWORK port and board check (If installed)....4
11.2.10 Feeding Bridge check (If installed)....4

Chapter 12
ELECTRO-ACOUSTICAL CALIBRATION

12.1 Generals....1
12.1.1 Artificial Ear check and calibration....2
12.1.2 Artificial Mouth check and calibration....3
12.2 Start of Procedures....4
12.3 AC-3 Artificial Head Calibration....4
12.3.1 Test set needed....4
12.3.2 Artificial Ear Calibration....6
12.3.3 Artificial Mouth Calibration....13
12.4 AC-4 Artificial Head Calibration....18
12.4.1 Test set needed....18

12.4.2 Artificial Ear Calibration 20
12.4.3 Artificial Mouth Calibration 27
12.5 Trimming Procedure 31
12.6 Electrical Noise Calibration 33

Appendix 1
Specifications on the Acoustic Measurements

A1.1 Introduction to quantities, measurement units and references .A
A1.2 Conversion factor ..... B
A1.3 Differences between Standards ..... B

Appendix 2
Communication Protocol for GPIB IEEE-488.2 port

Appendix 3
Error Messages

A3.1 Error and Warning Messages ..... A

Chapter 1

PRODUCT PRESENTATION

1.1 Introduction

CS8030 System – "Test System for Telephonometry" is a unit set, which allows executing, in a quick and efficient way, measurements of Telephonometry on all types of PSTN telephone sets, or parts, and on GSM cellular telephone sets. The System meets the rules of different countries.

CS8030 System is a User oriented system, and it allows preparing Test Programs, editing, storing it on disk or by LAN Interface to send it to all connected networks.

The base arrangement allows all Telephonometry measurements on PSTN telephone sets, Cordless, DECT, GSM[1] or other types, in according to the most important test methods, as UIT, IEEE, OREM, AUSTRALIA, etch…

On demand CS can supplies default files for different countries, able to propose parametric tests in according to different country Standards.

Use and Programming

All the operating phases:

- System SetUp
- Programming
- Measures and results display

are made by using the system monitor.

A keyboard and mouse make data introducing and choosing.

CS8030 System is programmable and employable in two different ways:

1) The first, and the most used, consists:
Assembling a test program in which are included, if need, some tests choused in the test family.
For each test, default parameters are proposed, in according to the selected Standard or Rules.

2) The second consists:
To choose and running a test program or a single test of the program selected by IEEE-488 port.

[1] The measurement needs an external radio interface.

By that the system can be considered completely open.

The programmer can choose three ways to save the measurement results:
- By IEEE-488 port
- by a local file
- by a remote file, using the LAN interface (optional)

For Telephonometry measurements is used the artificial head **AC-4**, with acoustic wide band and automatic mechanical devices to improve the ergonomics of operations.

CS8030 System….

- For its high-test speed and its immunity at ambient noise, is designed to work in manufacturing and test area or incoming inspection for components and semi-manufactured goods.
- For its high-test high accuracy and its high repeatability of measure this system can be used extremely well in design laboratories.
- For its low price the ratio performances/cost is very high.

1.2 Configuration

The system has a base configuration to work. It can be expanded by a set of accessories to complete and enlarge the functions.

The base system can become an automatic test bench connected to LAN, to realize a complete automation of manufacturing.

The base configuration is:

a) **CS8030** Test System for Telephonometry (Base unit)

b) **AC-4** the new artificial head **AC-4**, with wide band from 100Hz to 8000Hz, is designed to assure the max accuracy and repeatability for acoustic measures. **AC-4** also is designed with an up-to-date ergonomics to aids the use in manufacturing area. The handset is locked and unlocked on command, so to use one hand only for the operation.

All others connecting units are optional.

A typical configuration is:

a) **CS8030**	Test System for Telephonometry (basic unit)
b) **AC-4**	Universal Test Head with accessories – Band 100Hz to 8000Hz (as an alternative **AC-3** Test Head – Band 200Hz to 4000Hz).
c) **AC-3VV**	Structure for measurements Hands Free
d) **PH-18**	Sound Level Meter for ringing
e) **Graphic printer**	Local printer for test program documentation, measurement results, reports

1.2.1 Options

CS8030 System option:

a) **CS8030/NET**	Network interface - Connector RJ45
b) **CS8030-PSTN**	Feeding Bridge –PSTN user line simulator – design in progress
c) **CS8030-ISDN**	ISND interface– design in progress -.

1.3 General description

CS8030 System is a unity set, which use modern technical of measurement (F.F.T.[2] - etch.), for the test of telephone set

It allows a large number of different tests that can be arranged in every sequence; so it is possible to make either functional test during the manufacturing or laboratory test for Quality Acceptance

The tests are grouped in families as specified in the table.

TEST FAMILIES

ACOUSTIC TESTS:

- ⇨ Receiving and sending sensitivity frequency response (1/3oct or 1/12oct – in reduced band: 200÷4KHz or in extended band: 100÷8KHz);
- ⇨ Receiving and sending Loudness Rating – for all Standard;
- ⇨ Talker side-tone and Overall transmission;
- ⇨ Harmonic Distortion (THD);
- ⇨ Noise
- ⇨ Instability (Larsen);

***ELECTRICAL TESTS*:**

- ⇨ DC characteristics (available only with PSTN User Interface Simulator)(*);
- ⇨ Return loss and echo return loss;
- ⇨ Unwanted signal out the band(*);

(*) Optional – Near future implementation

***OTHER TESTS*:**

- ⇨ Magnetic field around the ear-cap (provided for coupling to hearing aids – UIT-P37); available only with **HA** accessory

[2] -Fast Fourier Transforms -

1.3.1 Programmability

Programming operations are:

• *New Program* - (see fig.1)

A new test program is created.
Elementary tests can be included in which are proposed the values of the default file. The programmer can accept or change the values related to the test needed (see fig.2).
In the program can be included also conditional jumps related to the test result.
A program is organized in one only sequence with a 250 elementary tests max.

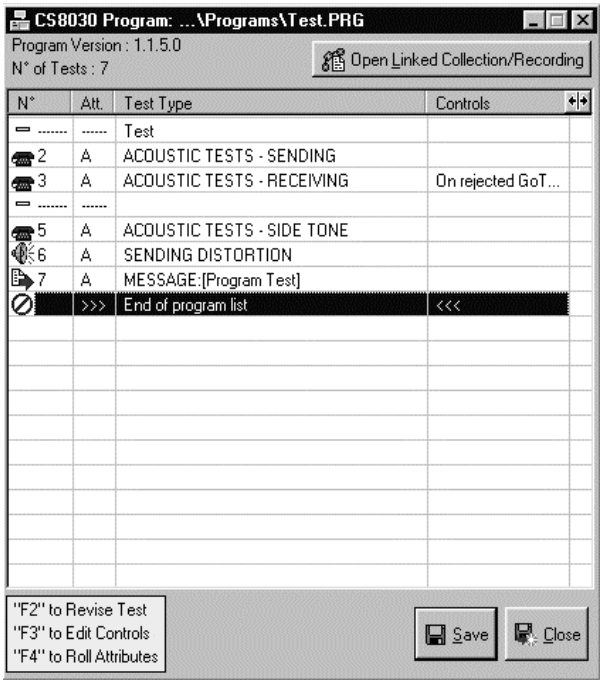


fig. 1

• *Load Program from file*

A program can be loaded from the system memory.
A loaded program can be modified, printed out or to make a copy (complete or part) and past it into another test program.

• *Save Program to file*

After preparation of a new test program or its editing it is possible to save it on file.

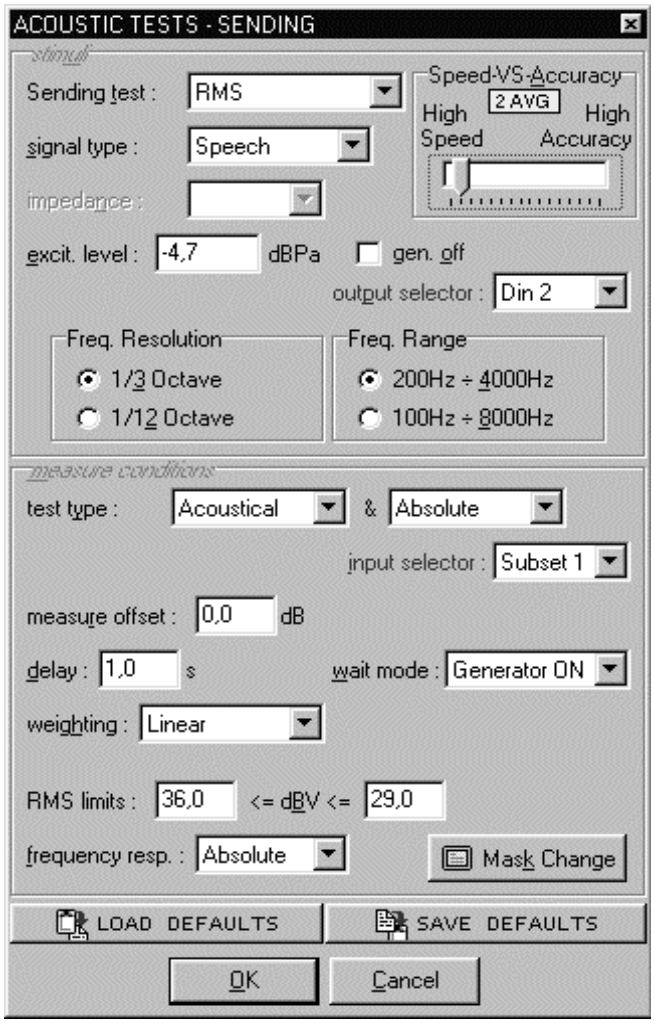


fig. 2

1.3.2 Operation

System allows the possibility to run a test program with three different attributes for each test:

AUTO, *DISPLAY* and *STOP (unconditioned).*

In AUTO mode, the test program runs to the end without stop if no errors have been found.

If an error is detected, the sequence stops and a diagnostic message is displayed on the monitor.

In DISPLAY mode the test whit this attribute is repeated continuously with display adjournment.

With *STOP* attribute, the system, after performing the test, stops the test program execution.

These different operating modes will be explained later on.

Chapter 2

INSTALLATION PLANT CHOICE AND INSTALLATION

2.1 Installation Plant selection

The **Customer** has the responsibility to provide at the choice of a sufficiently wide and suitable plant, where will be installed the **CS8030** System.

If the Equipments operating is incorrect, during the guarantee period, the CS-STRUMENTAZIONE ELETTRONICA S.R.L., self reserve the right of a formal visit of the environmental and electrical conditions, at Customer expenses, in order to assure the continuation of the guarantee period or Technical Assistance Contract

2.2 Environment

2.2.1 Floor

We advise against the **CS8030** System placement in a floor covered by moquette.
The flooring must necessarily be **antistatic**.

2.2.2 Sizes and Placement

Into the selected room they have to be foreseen:

- ✓ A central panel for the electrical system.
- ✓ An *eventual* air-conditioner not connected to the feeding system, if it is required by the temperature and humidity values.
- ✓ A cabinet where accessories and materials supplied with the System can be placed, for ex. Handbooks, cables, etch...
- ✓ Space round the System components as shown below:

CS8030	Front Back	Suitable for the operator 203 mm (8 in) min for a correct ventilation
AC-4 o AC-3		813 mm (32 in) of min. radius to avoid acoustic reflections
AC-3VV		1500mm (59 in) of min. radius for avoiding acoustic reflections. An anechoic room will be suitable for to have correct results

2.3 Power supply

2.3.1 Electrical Network Requirements

The electrical network to which to connect the **CS8030** System must be **single-phase** with a delivered voltage equal to 230 Volt-50/60Hz; required voltage tolerance is of +10% and of -15% on the nominal value.

If required, it is possible to supply the equipments prearranged for 115 Volt.

If the voltage delivered from network should be particularly variable, even if within the tolerance limits, it is required the use of a voltage corrector.

It is important that the plant is equipped with a good ground connection and that the average voltage between network **neutral wire** and **ground** connection is never higher than 1 Volt RMS, with fluctuations not higher than 25 mVolt.

Ground ohm resistance shall not be higher than 6 Ohms.

An insulation transformer will be indispensable if the voltage between neutral wire and ground should exceed the suggested limit.

Network micro interruptions are acceptable when they are not higher than 30 ms. Over this value bad operations and memory loss can be manifest, either of program or calibration.

2.3.2 Electric Plant fulfilment

Power outlets for janitorial maintenance (vacuum cleaners, floor buffers, etc.) must be wired on a separate circuit breaker from **CS8030** System.

If these precautions are not taken, operation of such equipment will induce noise transients on the system power lines, which can cause abnormal operation of the System.

Utility power company switching, elevators, switching heavy electrical machinery loads, etc. or operating certain types of equipment near the System can cause problems, even though the source is on a different circuit breaker.

In some cases, it is mandatory to provide a separate circuit and circuit breaker for the System directly from the **main building power**.

Feeding of whole System shall start from an only console easily accessible, installed in the room where the System is present, and fitted with a magnetothermic switch of suitable power.

Here follows are reported the power engaged by the Units settling the **CS8030** System.

Model	Description	Power (VA @ 230 V)
CS8030	Test System for Telephonometry with monitor	220max
Monitor	Power available at the Monitor outlet	115max

2.4 Environmental Conditions

2.4.1 Temperature and Humidity

Temperature and humidity limits in which the System can work are wide, but for maximizing the working and availability times we suggest to air-conditioning the environment into the System is being operate.

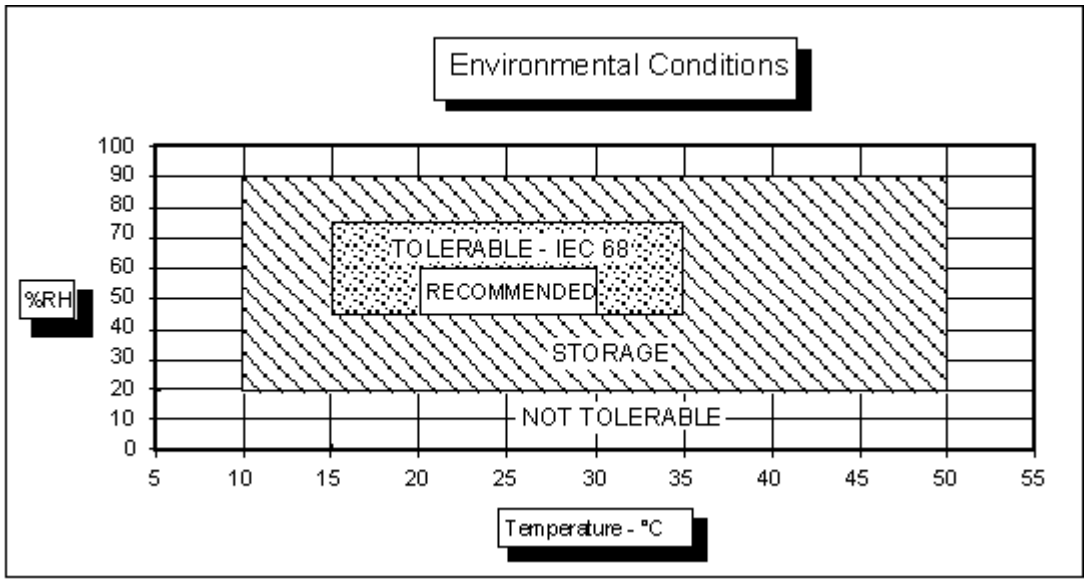


fig.2.1

Measuring tolerance for each device of **CS8030 System** is valid and verified in RECOMMENDED environmental condition.

Operating in TOLERABLE field the measurements can be out of the characteristics but they return when the environmental conditions become again RECOMMENDED.

Do never exceed **STORAGE** condition; the characteristics may change permanently.
Quick consignment using the original packing

Devices as the microphone of the Artificial Ear must be packaged with a sealed box having inside salt, to maintain the relative humidity at a low level.

2.5 Environmental Noise

Environmental Noise around the System influences on the transmission measures results and on the ringer level measures.

- **Transmission and side-tone measures**

By the used measure technique, the measures can be considered as selective, with band of ±4.4Hz to ±0.25Hz. only for the frequencies interested in the response analysis. Therefore only the noise with such exact frequencies can influence the measure.

The operator, choosing the measure speed, selects the band.

On the table are shown the possible measure errors produced by a "speech" noise source (CCITT G227) on the handset under test (for a typical measure speed).

An industrial environment noise, for provision of the law, cannot be over 80 dBspl, for which, for practical purposes, are not required protections.

Signal/noise	**L.R.** or **R.E.**[1]
15 dB	±0.1 dB
10 dB	±0,2 dB
5 dB	±0.4 dB

• **Magnetic measures (hearing aids)**

The manufacturing area, during measurements of magnetic field around the caps (CCITT- P37), must not have magnetic noise produced from transformers, motors, etch,..

2.6 Installation

After having carefully read all previous paragraphs of this Chapter and provided by its requirements, it can be proceed to the System installation.

To place the Units on an independent table, in such a way that there are not any frequency vibrations caused by external organs, which can be transmitted to the Artificial Head.

Proceed to the connection of the Units.

AC-4 or **AC-3** or **AC-3VV** CONNECTION

Connection of the Artificial Head **AC-4** or **AC-3** or **AC-3VV** to **CS8030** is made by an 8 poles cable Mod. **X109-2**, which must be inserted in the appropriate *in/out* socket of the AC-4 or in the *in/out* socket of the AC-3005 unit, equipped on **AC-3** or **AC-3VV**, and in *din1, 2,3,4* socket on **CS8030** (usually *din1).*

PH-18.1 CONNECTION(optional)

Connection of the Sound Level Meter to **CS8030** is made by its own cable, which must be inserted in the *din1, 2,3,4* socket free on **CS8030** or at the *auxiliary* input on **AC-4** Artificial Head; when **AC-3** or **AC-3VV** Artificial Head are used, the cable can be connected to the *aux* input on the **AC-3005** amplifier unit.

Monitor CONNECTION

The power cord of the Monitor must be connected to the outlet on the rear of **CS8030** and the signals cable is connected to the *monitor* 15 poles female connector.

Keyboard and mouse CONNECTION

Keyboard cable is connected to *keyboard* Din 5 poles female connector.
Mouse cable is connected to *mouse* Minidin 6 poles female connector.
The connectors are on the rear panel of **CS8030**.

1 Loudness Rating and Reference Equivalent are measurements made by **CS8030** - In the range 200÷4000Hz and 1/3 of octave.

Printer CONNECTION(optional)

The printer cable must be connected to the *printer* port, 25 poles female connector, on **CS8030**'s rear panel.

CS2036 or **CS2040** CONNECTION

The connection between **CS2036** or **CS2040** Acoustic Calibrator and **CS8030** is made by an 8 poles cable mod. **X109-2** which must be inserted, by one side, to the *in/out* socket of **CS2036** or **CS2040** unit and, on the other side, to the *din1,2,3,4* port on **CS8030**'s rear panel.

Connect the power supply cord and switch the power ON.

Connect the System, by the ground jack placed on the rear of the instrument, to one ground reference point .

If an AC-3 or AC-4 Artificial Head is used, connect it to one ground reference point also.

After 20 - 50 sec, time necessary to test the memory and to install needed drivers, on the monitor appear an image as fig. 2.6.1, followed of fig. 2.6.2, and at the last the fig.2.6.3.

From this moment **CS8030** is ready to operate.

Take care!

*Connections between the units must be made with the apparatus **OFF**.*
*Then switch **ON** all devices to operate.*

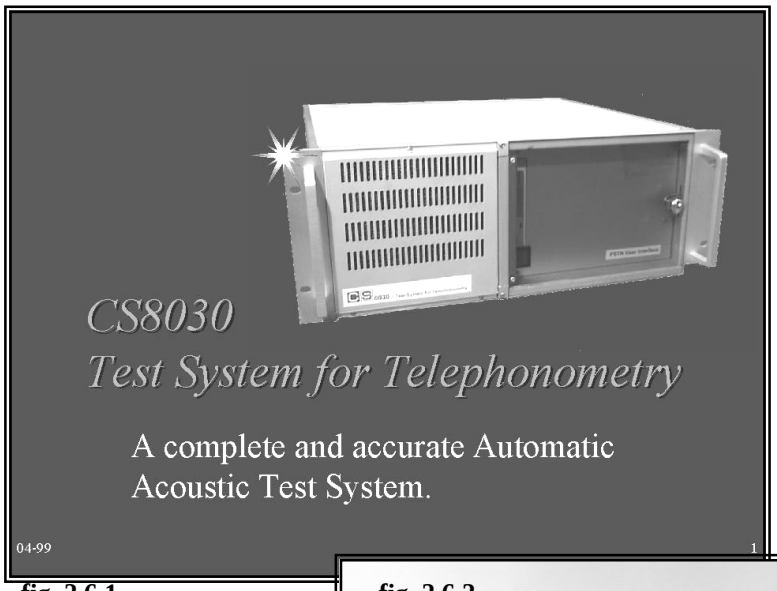
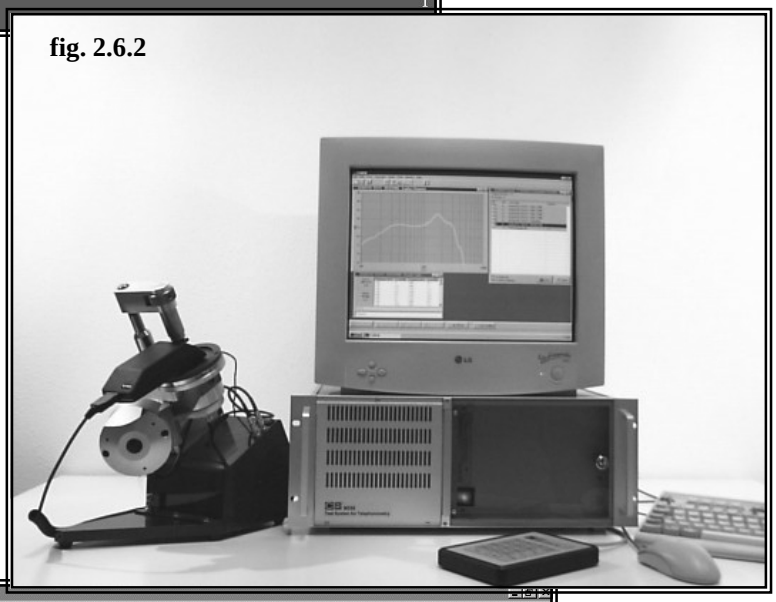


fig. 2.6.1

fig. 2.6.2



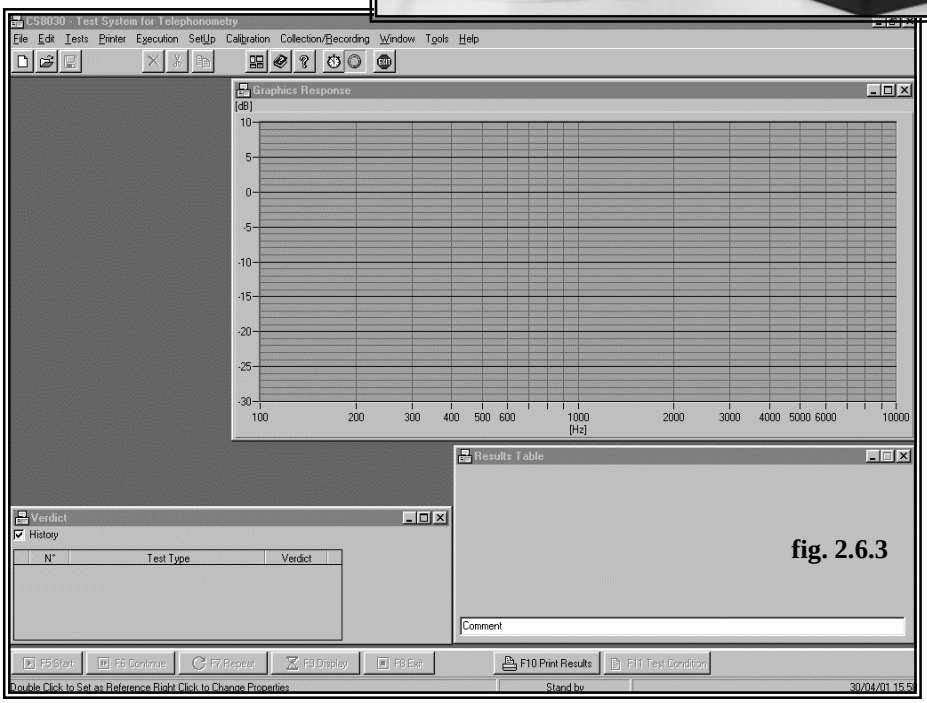


fig. 2.6.3

Chapter 3

HARDWARE

CS8030 - Hardware description

3.1 Main characteristics

CS8030 basic unit is the essential element of the System.

It is a compact instrument, which can be easily transported and which is entirely accessible.

In fact by unscrew the four screws of the top cover and sliding it off, all components inside are accessible.

Unit is designed for large future expansion.

Power Supply		
	Voltage	180 ÷ 264V_{ac} or 90 ÷ 132V_{ac} 48 ÷ 63Hz
	Power max.	50VA @ 230V-50Hz
Environment		
	Temperature	15 °C ÷ 35 °C
	Relative humidity	see § 2.4
Dimension		Standard Rack 4 unit with handles. Depth = 482mm (rear plugs included) High = 190mm Width = 483mm
Weight		10 Kg

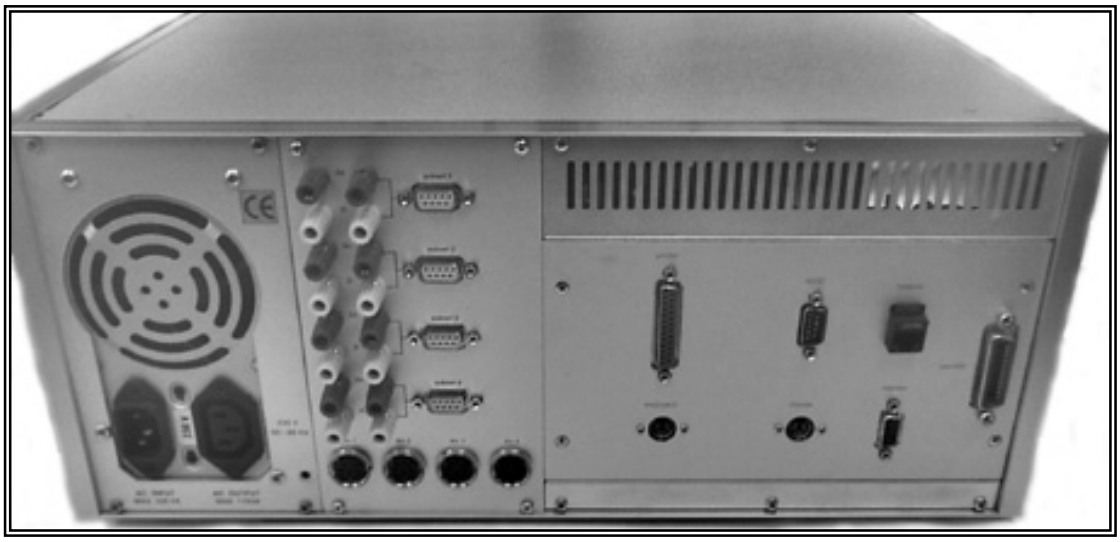
3.2 Front panel

The front panel has a protection in Plexiglas under lock and key.

Inside there are the light power switch and the floppy disk driver.

3.3 Rear panel

The rear panel is divided in three parts:



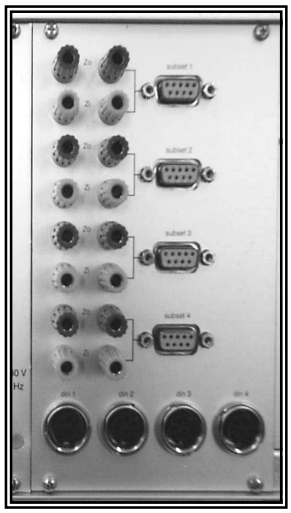
1 – Power supply unit
2 – I/O section
3 – Peripheral section

3.3.1 Power supply

Power supply unit has two outlets; one male for the general power cord, and one female for the monitor.
By that is possible to turn ON the System by only the switch on the front panel.

Power Supply Voltage Power Abs. max @230V	•230 V +10%/-15% 50/60 Hz •115 V +5%/-15% 50/60 Hz (Optional) •220 VA (CS8030 with Monitor connected) •115 VA (at Monitor plug)

3.3.2 I/O Section



CS8030 System is able to command up to four-test bench.
On the rear panel we have:

- 4 *subset* connectors to connect the devices under test (see fig.3.3.2.1, fig.3.3.2.2)
- 4 *din* connectors to connect the Artificial Heads AC-4, or AC-3, AC-3VV, Precision Sound Level Meter PH-18, etc. (see fig. 3.3.2.3, fig.3.3.2.4)
- 4 groups of binding posts *Zi* and *Zo* for the correct impedance terminations (see fig.3.3.2.2).

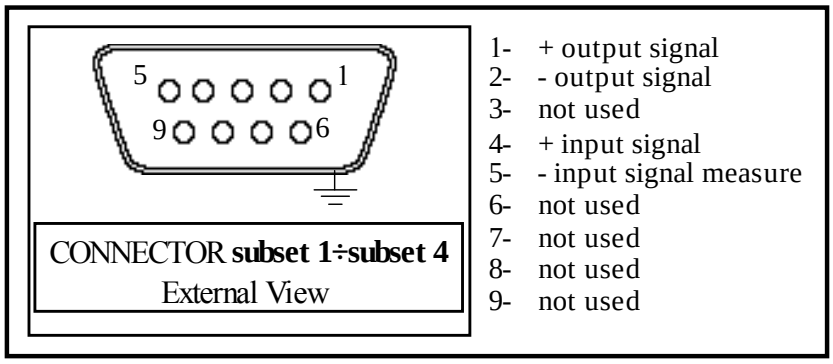


fig.3.3.2.1

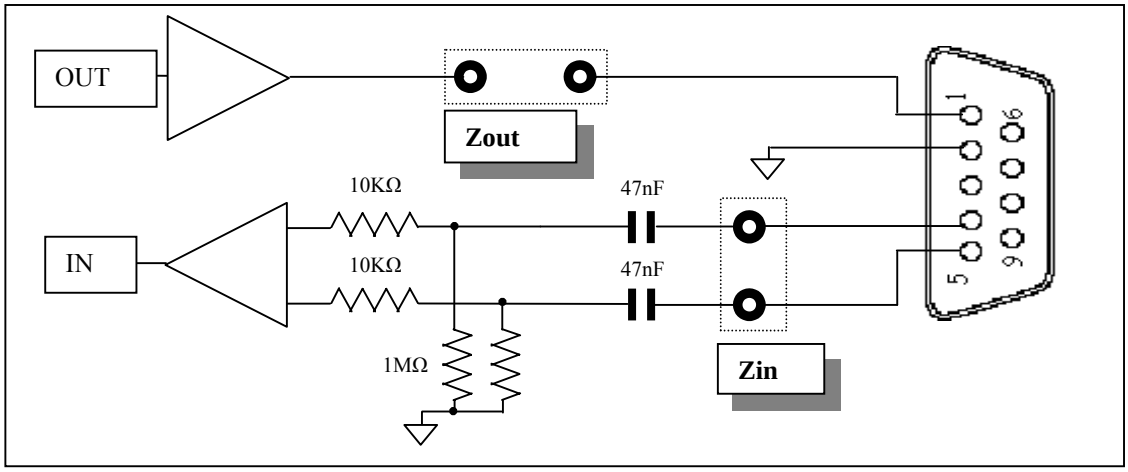


fig.3.3.2.2

Subset connectors Electric Characteristics	
Inputs	
Impedance Z_{in}	Manual insertion on Z_{in} binding posts on the rear panel
Range	-50 ÷ +20 dB_V peak
Outputs	
Impedance Z_{out}	Manual insertion on Z_{out} binding posts on the rear panel
Voltage	-40 ÷ +11 dB_V f.e.m.
Current	max: 12 mA @10 V peak 30 mA @3 V peak

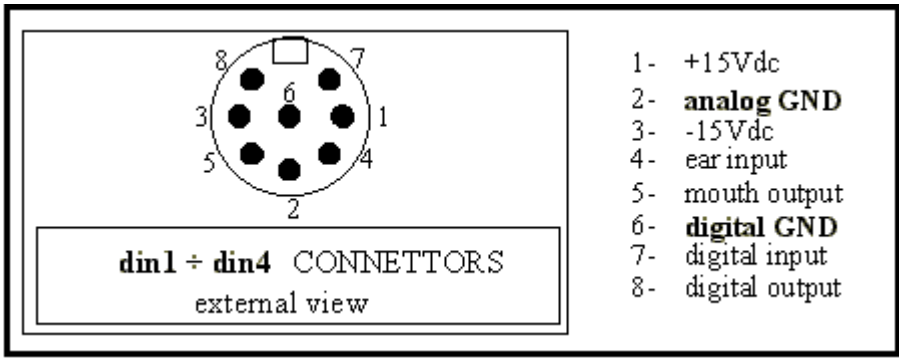


fig.3.3.2.3

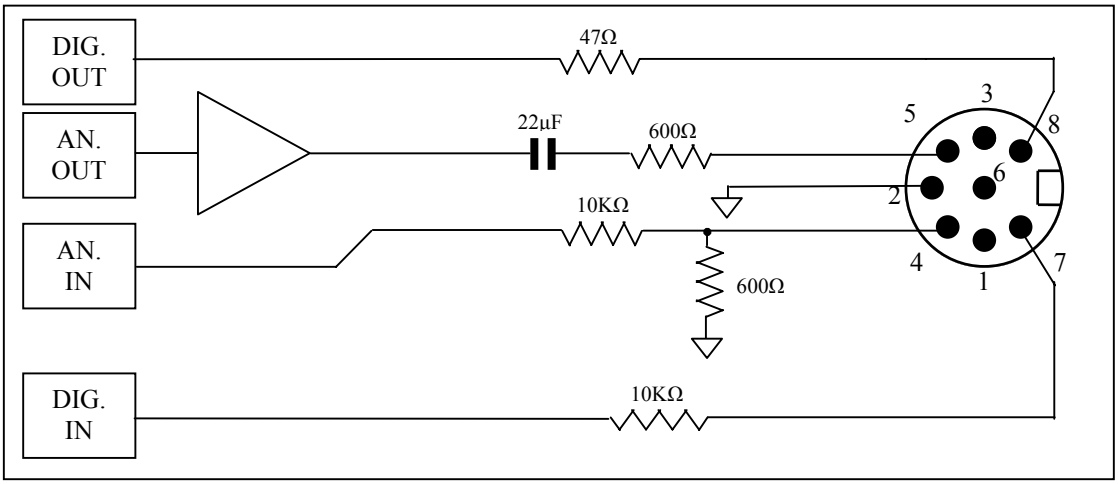


fig.3.3.2.4

Din connectors Electric Characteristics	
Inputs	
Impedance	600 Ω unbalanced (ground reference)
Range	-50 ÷ +20 dB_V peak
Outputs	
Impedance	600 Ω unbalanced (ground reference)
Voltage	-40 ÷ +11 dB_V f.e.m.

3.3.2.1 Feeding Bridge (Optional)

If installed, the "Feeding Bridge" option, has the following electrical scheme:

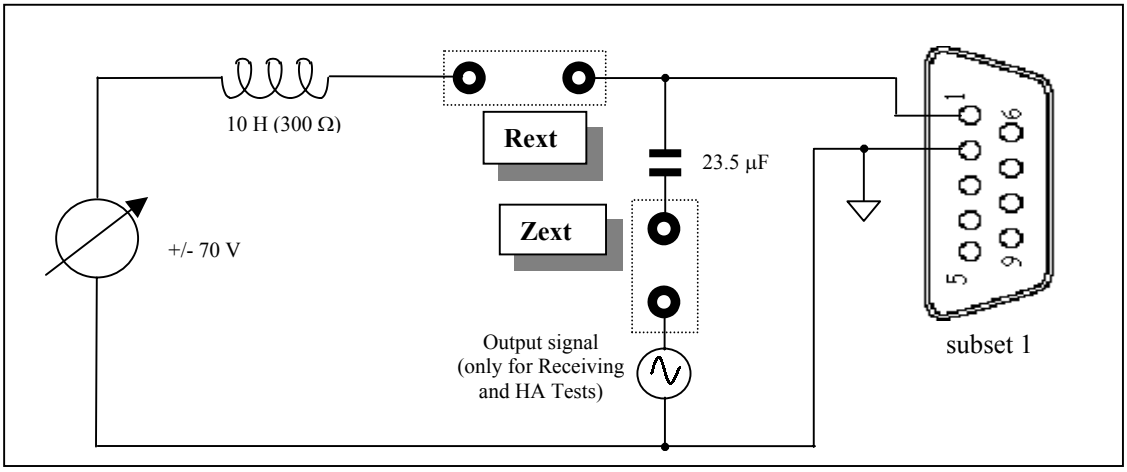


fig.3.3.2.5

Where Z_{ext} is the line termination resistance or the output impedance, and R_{ext} is the feeding resistance.

The binding posts R_{ext} and Z_{ext} are used for their correct connections.

The bridge is asymmetric with values according to TBR38 – A 1.10 rules.

Inductor resistance is thermically compensated for the working temperature field.

Only for *subset 1* connector we have:

Subset 1 connector Electric Characteristics	
Output	
Impedance Z_{ext}	Manual insertion on Z_{ext} binding posts on the rear panel
Resistance R_{ext}	Manual insertion on R_{ext} binding posts on the rear panel. The total feeding resistance is 300 Ω+ R_{ext}
Voltage	-70 ÷ +70 V
Current	max: ±100 mA

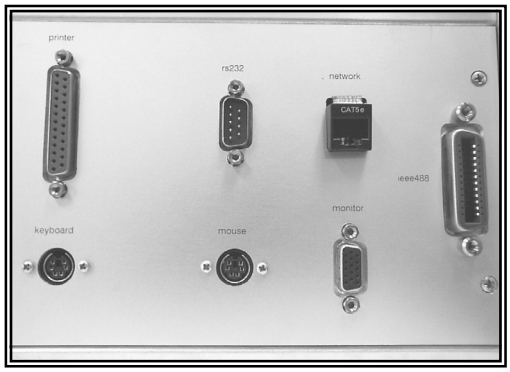
CAUTION: **CS8030** can supplies test voltages up to 70 V, dangerous for the operator; thereof the D.U.T. should be arranged into a protection device equipped with an electric contact.

Between pin 6 and 7 of *subset 1* connector must be connected this contact which is closed if the protection device is closed. In this way **CS8030** can runs with proper complete characteristics.

With protection device open (protection contact open) the **CS8030** can not supplies test voltages greater than 50 V.

3.3.3 Peripheral Section

To connect external peripherals **CS8030 System** has proper connectors:



⇒ printer
⇒ keyboard
⇒ rs232-serial bus RS232
⇒ mouse
⇒ network
⇒ monitor - monitor VGA
⇒ ieee488

The “printer” connector, female 25 poles D type, is used to connect an external printer (optional). The communication between CS8030 System and printer is bi-directional. To connect the printer, use standard cable Mod.X110-1.

The “keyboard” connector, female 5 poles DIN type, is used to connect the external keyboard.

The “rs232” connector, male 9 poles D type, is used to connect an external serial printer (optional).

The “mouse” connector, female 6 poles MINIDIN type, is used to connect the PC mouse.

The “network” connector, female RJ45 8 poles (cat.5), is used to connect the CS8030 System to a Local Area Network (LAN) that use TCP/IP or NetBEUI protocol.

The “monitor” connector, female 15 poles D type, is used to connect the monitor VGA with resolution 800x600 pixels minimum.

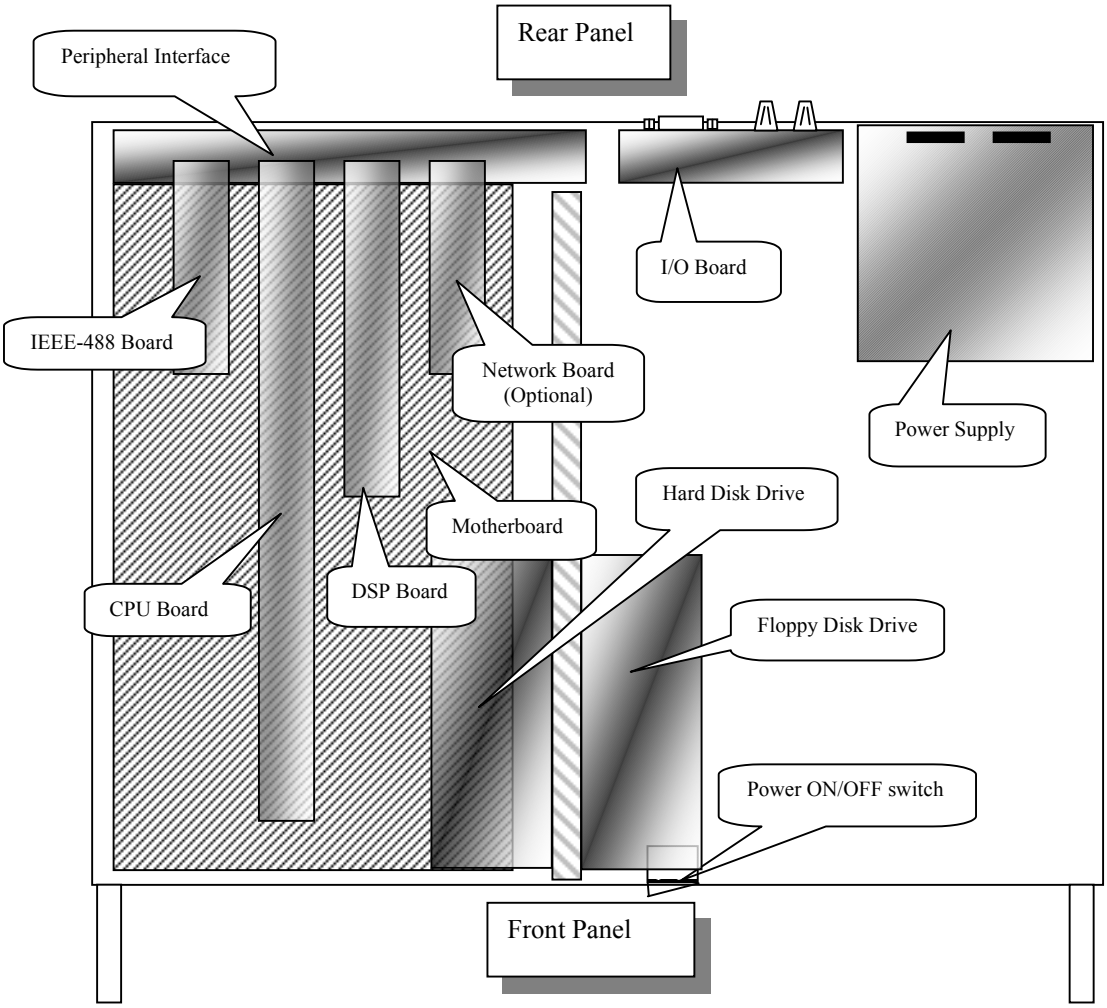
The “ieee488” connector, of GPIB interface board IEEE 488.2, is used to control CS8030 System from remote station (Host PC). Connecting the system with cable Mod.C488 to PC, is possible, from this one, send commands to CS8030 System and receive Test results.

The GPIB is the worldwide standard for connecting instruments to computers, and is adopted by a wide variety of both instrument and computer manufacturers.

3.4 Internal

Internal structure is a motherboard type to which are connected all main components. Connectors and flat cables make any other interconnection.

This design makes the equipment more reliable and it allows the maximum rapidity for maintenance, upgrade and repair interventions.



Caution!

Danger of explosion if the lithium battery of CPU card is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Chapter 4

FUNCTIONS AND COMMANDS

General Description

4.1 Generals

To switch on CS8030 System, please follow the System Start Up procedure (see § 2.6).

After the Start Up, appears on the screen, for few seconds, the dialog box shown below. During this time the System CS8030 checks all the DIN ports.

Artificial Head Mod.AC-4 is able to transmit to the System their presence and serial number. For all others devices that can be used (i.e. Sound Level Meter, Acoustic Calibrators, Artificial Head Mod.AC-3, etc.), manual settings are needed (see § 6.1.5).

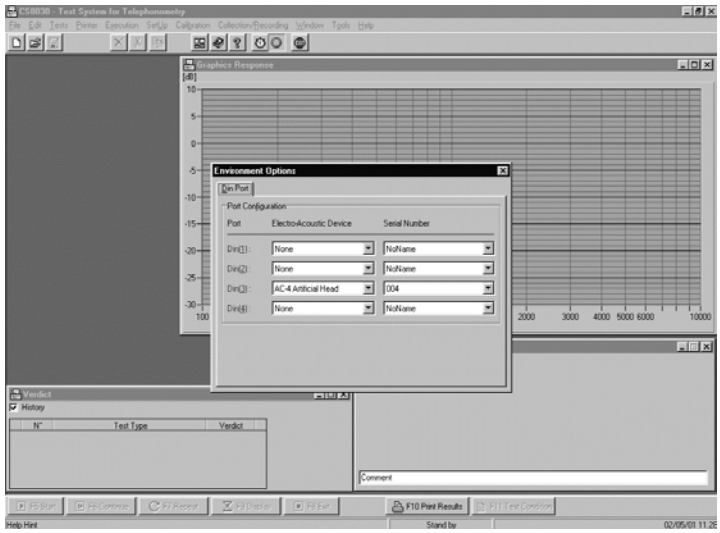


fig.4.1

After that, the CS8030 System goes on showing **Graphic Response**, **Results Table** and **Verdict**[1] windows**.**

Notice that, the windows arrangement on screen may be different from which illustrated on this manual.

The **Graphic Response** window displays, with graphic representation, all the result gets from Device Under Test. After performed one Test at least, excluded a **Test Message** and a

[1] N.B. In this Chapter and next, references to **Keys**, **Shortcuts**, **Menus**, **Windows** or **Commands** are in **bold** type.

Test Comment, moving the mouse pointer over the window and clicking with the right mouse button, will appear the cascading Menu for graphic options (see fig.4.1.1).

The selected functions are marked by a check mark ✔ or ●.

Any change of settings, done in this Menu or in the **SetUp** Menu, is active temporarily. At System restart, the settings, which are in the Environment Options, will be restored.

The **Properties** command, allows entering in the **Graphic** dialog box of the **Environment Options**, where is possible to set as default the changes done to the parameters (see § 6.1.4).

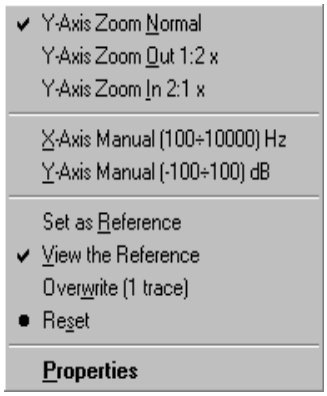


fig.4.1.1

The **Results Table** window shown, with table representation, all numerical results obtained from Device Under Test.

The **Verdict** window shown the result of every single Test with a screen message FAIL or PASS if the result is in or out the limit range that has been entered (see § 7, § 8, § 9). Moreover, at Program end, shown on screen the REJECTED (FAIL result of one Test at least) or ACCEPTED (all Tests with PASS result) message.

At the top of the window, selecting the **History** parameter is possible to see the detailed list of all the results per single Test, which forms the active Program.

In the main window there also the following components:

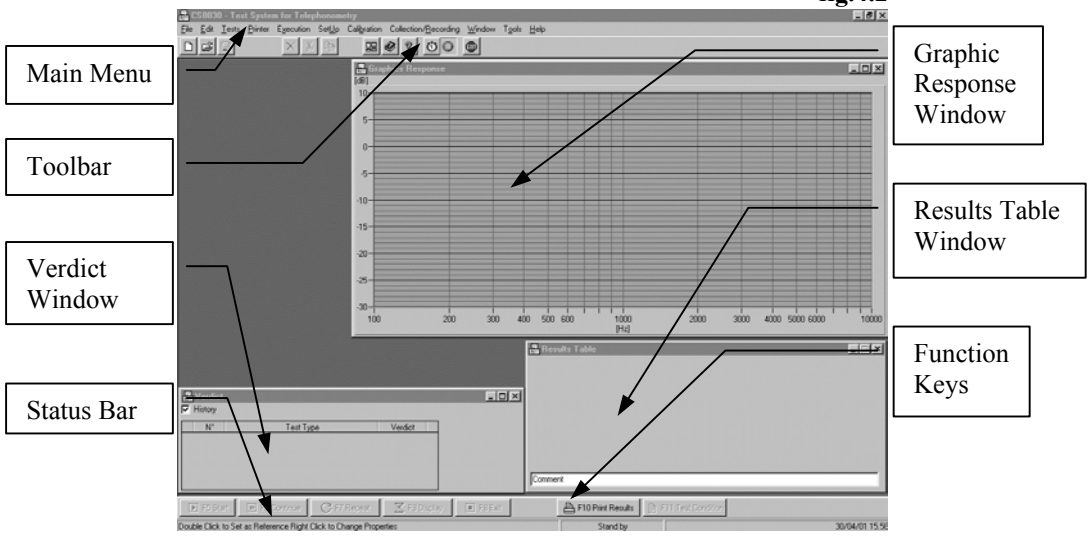
Main Menu Allows selecting one active Menu

Toolbar Allows, by Toolbar buttons, to perform in a fast way, some Menu's commands. Also, shows the status of System's resources by the Status led

Function Keys Allows, by the **F5÷F11** keys, to activate some functions for Test Program management

Status Bar Shows the descriptive name for each Toolbar's button, date and time and System status

fig.4.2



To understand which is the related action to a Toolbar's button, moving the mouse pointer on one of them, appears the descriptive name in a tool-tip.

In table 4.1 are shown Toolbar buttons, the Menu commands and respective actions.

Button	Command	Action
	New Test Program	Create a new Test Program
	Open	Open an existing Test Program
	Save	Save the active Test Program
	Undo	Reverse last action
	Redo	Repeat last action
	Delete	Delete the selected Test
	Cut	Move the selected Test, temporarily, in the clipboard
	Copy	Copy the selected Test, temporarily, in the clipboard
	Paste	Paste the Test, from clipboard to the specified position
	Load default windows desktop	Restore the saved windows arrangement
	Help Contents	Show the On Line Help contents
	Help CS Strumentazione elettronica s.r.l.	Show CS's e-mail address and telephone number for Customer support
	Restart	Restart the System. The procedure could take from 5 to 15 seconds.
	Exit	Close the working session and turn off the System

tab.4.1

During Test execution, the Operating System allocates memory to manage the data, decreasing the System resources.

The Status Led on the Toolbar shows the System resources condition. There are three different led colors:

Red	The System resources are very low. Is necessary to restart the System as soon as possible to avoid crashes or errors
Yellow	The System resources are low. Is not necessary to restart the System immediately but the Test time could increase
Green	The System resources are OK

On the Status Bar, is shown the CS8030 System status:

Stand by	The System is waiting for Operator's command. No Programs, Collections, Recordings or Calibrations are running.
Execution	The System is executing a Test or a Program. During this time are actives only the **File**, **Printer** and **Execution** Menu.
Viewing	The System is showing a Recording or a Collection. During this time are not actives the **Execution** and **Calibration** Menu.
Recording	The System is recording a Collection or Recording. During this time is not active the **Calibration** Menu.
Calibration	The System is calibrating an Artificial Head. During this time is not active the **File**, **Printer**, **Window** and **Help** Menu.

In table 4.1.1 are listed the **Function Keys**, the respective Menu commands and actions.

Button	Command	Action
	All Program from TOP	Start Program execution with Test at top of the list
	Continue Program	Continue the Program with the next Test
	Repeat Test	Repeat the active Test
	EXIT Program	Exit from Program execution
	Display Test	Run the active Test in Display mode (see § 4.5)
	Results	Print results of active Test
	Test Condition	View settings of active Test

tab.4.1.1

A right-pointing arrow ► next to the Menu item text, means that this item has a related Submenu. A Submenu is a Menu item that expands to show more Menu choices. Moving the mouse pointer on the command, will be open the related Submenu.

The underlined character in Menu or command's name is the 'accelerator' the user can type, in combination with the **ALT** key, to navigate a menu or perform a command using the keyboard.

An ellipsis (…) following a Menu item's text means that choosing the Menu item will invoke a dialog box. For example, selecting the **Open** command in the **File** Menu, will be open the **Open file** dialog box.

The command's name in bold type means that it's a default command. It's so sufficient a double click on the Menu title to active it.

The command's name in gray type or Toolbar's button dimmed, means that the related command is disabled and then, not available. For example, the **Undo** command on the Toolbar is available only when the System has performed at least one operation (i.e. cut, copy, paste, etc.) on the Program.

The **Help Contents** button on the Toolbar, allows entering in the On Line Help, where it's possible to perform the search for the desired argument, using the **Contents** or **Search** function.

4.1.1 Shortcuts

A large part of the available commands, have one shortcut. The command's shortcut, if exist, is shown on the right side of the command's name in the Menu.

For example, to open a new Program, it's possible to select the **New Test Program** command in the **File** Menu or press simultaneously the **CTRL+N** keys

Following, the summarizing table of all shortcuts is shown:

Menu	**Shortcut**	**Command**
File	CTRL+N	New Test Program
	CTRL+O	Open
	CTRL+S	Save
	CTRL+A	Close All
	CTRL+I	Import (for CS8030 without *NET* option)
	CTRL+E	Export (for CS8030 without *NET* option)
	F12	Exit
Edit	CTRL+Z	Undo
	CTRL+Y	Redo
	CTRL+X	Cut
	CTRL+C	Copy
	CTRL+V	Paste
	CANC/DEL	Delete
	CTRL+Q	Find
	F2	Revise Test
	F3	Edit Controls
	F4	Roll Attributes
Tests	INS	Comment
	CTRL+M	Message
	SHIFT+F1	Acoustic Tests – Sending
	SHIFT+F2	Acoustic Tests – Receiving
	SHIFT+F3	Acoustic Tests – Side-Tone
	SHIFT+F4	Acoustic Tests – Over-All
	SHIFT+CTRL+F1	Acoustic Tests – TE Noise Sending
	SHIFT+CTRL+F2	Acoustic Tests – TE Noise Receiving
	SHIFT+CTRL+F3	Acoustic Tests – TE Noise Side-Tone
	SHIFT+F7	Acoustic Tests – Instability (Larsen)
	SHIFT+F8	Acoustic Tests – Acoustic/Electrical shock
	SHIFT+INS	Acoustic Tests – Hearing aids
	CTRL+F1	Distortion Tests – Sending
	CTRL+F2	Distortion Tests – Receiving
	CTRL+F3	Distortion Tests – Side-Tone
	CTRL+F7	Distortion Tests – Over-All
	SHIFT+F9	Electrical Tests – DC Characteristics
	SHIFT+F10	Electrical Tests – Impedance

Tests	SHIFT+F11	Electrical Tests – Return-loss
	SHIFT+F12	Electrical Tests – UnWanted signals
	CTRL+INS	AC-4 Control
	CTRL+F9	User Program
Printer	CTRL+R	Results
Execution	F5	All Program from TOP
	SHIFT+F5	All Program from HERE
	CTRL+F5	Only THIS TEST
	F6	Continue Program
	F7	Repeat Test
	F9	Display Test
	F8	EXIT Program
	F11	Test Condition
SetUp	CTRL+U	Environment Options
Collection/Recording	CTRL+L	Collection for Report
	CTRL+G	Recording for View
	CTRL+W	View Data File
	F11	Test Condition
	CTRL+P	Import Collection/Recording
	CTRL+T	Export Collection/Recording
Windows	CTRL+D	Load Desktop
Tools	CTRL+J	Disk and Memory status
	CTRL+F	Defrag Hard Disk
Help	CTRL+H	About

*** SHIFT = "⬆" button** **tab.4.2**

The shortcuts are not available if any Menu is open.

4.2 File Menu

In this Menu there are the commands regarding creating, saving and opening Programs, plus other additional functions.

Some of these commands are available on the Toolbar (see tab.4.1).

The System keeps a list of the Programs used most recently.

At the bottom of the Menu, are shown at maximum four Program's names. Just click on one of the items to re-open that Program.

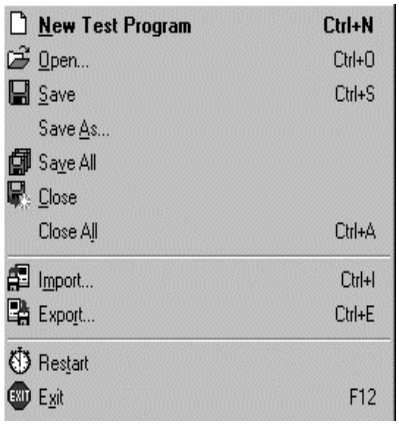


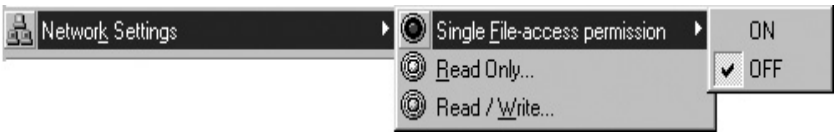
fig.4.3

In the following table are listed the **File** Menu choices.

Command	**Action**
New Test Program	To create new Test Program
Open	To open an existing Test Program
Save	To save the active Test Program. The Program or new folder's name, must be at maximum 20 characters length
Save As	To save the active Program with a different name or with a different path from the default one
Save All	To save all the opened Test Programs

Close	To close the active Test Program
Close All	To close all the open Test Programs
Import (for CS8030 without *NET* option)	To import a Test Program from Floppy Disk
Export (for CS8030 without *NET* option)	To export a Test Program to Floppy Disk
Restart	To restart the System
Exit	To end the working session and turn off the System

For CS8030 System with *NET* Option, instead of **Import/Export** functions there is **Network Settings** Command.



In the Submenu, it's possible to set files (Programs, Collections, Recordings) attribute (Read only or Read and Write).

If **Single File access permission** is ON, it doesn't allow multiple opening of the same file; this prevents undesired changes on the file that is used during work session.

4.3 Edit Menu

In this Menu there are all the commands to modify a single Test or a whole Program.

Some of these commands are available on the Toolbar (see tab.4.1).

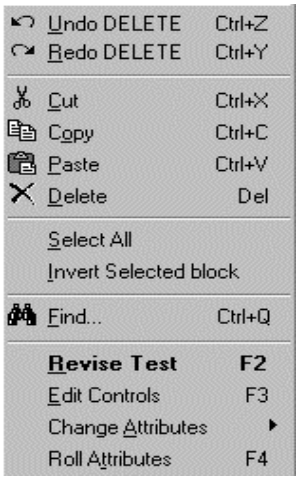


fig.4.4

In the following table are listed the **Edit** Menu choices.

Command	**Action**
Undo	To reverse last action performed
Redo	To repeat last action performed
Cut	To move temporarily on the clipboard, the selected Test
Copy	To copy temporarily the selected Test on the clipboard
Paste	To paste the Test from clipboard to the selected position
Delete	To delete the selected Test
Select All	To select all Tests in the active Program
Invert Selected block	To automatically deselect all Tests previously selected (always from Test N°1 to n) and select all remaining Tests
Find	To search in the Test Program for a text string. The first Test, where the string has been

	found, is highlighted. Press **Find Next** button to see next
Revise Test	To view the specific parameters of the selected Test, in the **Test Condition** window (see § 7, § 8, § 9)
Edit Controls	To set controls for the selected Test (see § 5.5)
Change Attributes	To set an attribute for the selected Test (see § 5.4)
Roll Attributes	To cycle attribute of the selected Test, through the possible choices

4.4 Tests Menu

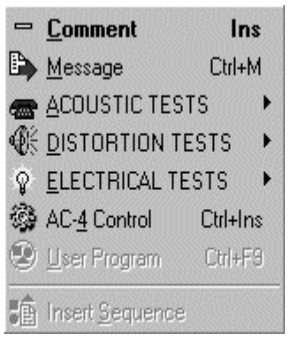


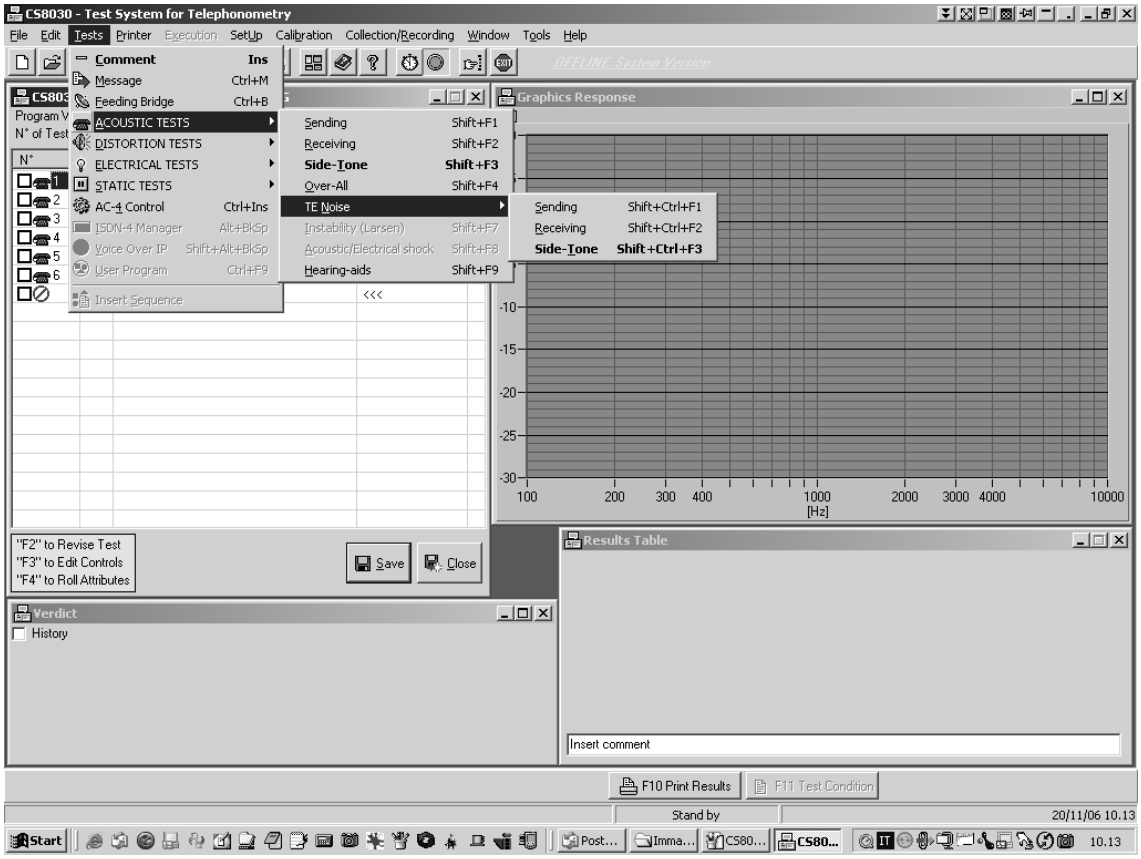
fig.4.5

In this Menu there are all commands about the Test choice; the Test will be insert in the list of the active Program.

The Test choice requires, moreover, to set all the specific parameters, if there are, that appears in the **Test Condition** window (see § 7, § 8, § 9).

In the following table are listed the **Tests** Menu choices.

Command	**Action**
Comment	To insert a Test Comment in the active Program
Message	To insert a Test Message in the active Program
Acoustic Tests	To make active the Submenu containing the **Sending**, **Receiving**, **Side-Tone**, **Over-All, TE Noise** Test (see § 7)
Distortion Tests	To make active the Submenu containing the **Sending**, **Receiving**, **Side-Tone**, **Over-All** Test (see § 8)
Electrical Tests	To make active the Submenu containing the **Return-Loss** Test (see § 9)
AC-4 Control	To Insert an AC-4 Control Test in the active Program
User Program	To execute User's Programs, i.e. to control external devices
Insert Sequence	To insert a pre-constructed Tests sequence in the active Program



Acoustic Tests - TE Noise

4.5 Printer Menu

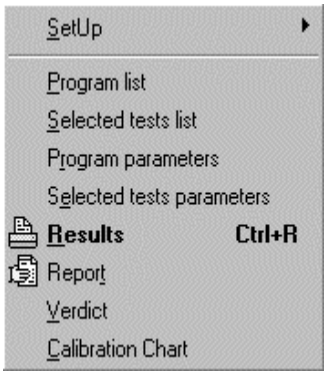


fig.4.6

In this Menu there are all the commands concerning printing of results, report or else.

After a command execution from this Menu, the System displays the **Print Setup** dialog box. It's so possible to set or verify all the printer's parameters before to execute the print process.

Otherwise, selecting the **Function Key** F10 Print Results will be performed, automatically, the print process.

In the following table are listed the **Printer** Menu choices.

Command	**Action**
SetUp	To make active the Submenu with **Printer** and **Options** commands
Program list	To print the Tests list, with related attributes and controls, of the active Program
Selected tests list	To print the selected Tests list
Program parameters	To print all Test's parameters that are in the list of the active Program
Selected tests parameters	To print the selected Test's parameters in the list of the active Program
Results	To print all the results regarding the selected Test, with table and graphic representation

Report	To print the Collection Report
Verdict	To print all the results of every single Test that forms the active Program
Calibration Chart	To print the calibration form of AC-4 and AC-3 Artificial Heads (see § 12)

For more details, please refer to § 10.

4.6 Execution Menu

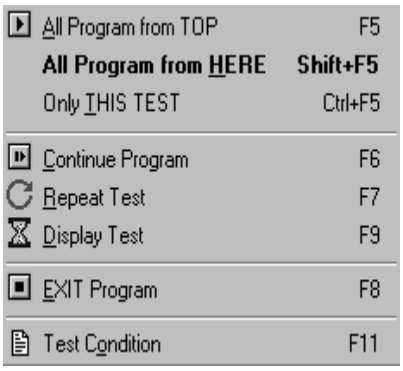


fig.4.7

In this Menu there are all the commands concerning Programs execution.

The main commands are available also like **Function Keys**, at the bottom of the screen.

During Program or single Test execution with DISPLAY attribute (see § 5.4), is displayed, on the Toolbar, the icon.

In the following table are listed the **Execution** Menu choices.

Command	**Action**
All Program from TOP	To execute the active Program from Test number 1
All Program from HERE	To execute the active Program from the selected Test
Only THIS TEST	To execute only the selected Test in the active Program
Continue Program	To continue the Program performance with the next Test. This command is active only when the Program performs a Test with STOP or DISPLAY attribute (see § 5.4).
Repeat Test	To execute, only for one time, the selected Test. This command is active only when the Program performs a Test with STOP or DISPLAY attribute (see § 5.4).
Display Test	To set, temporarily, the selected Test, with DISPLAY attribute (see § 5.4). This command is active only for Tests with STOP attribute (see § 5.4). To continue the Program execution, use the **Continue Program** command or press the shortcut button or the equivalent **Function Key**
EXIT Program	To end execution of active Program
Test Condition	To view the specific parameters for the selected Test in the active Program. This command is active only for Tests with STOP attribute (see § 5.4) or when the System is in Viewing mode (see § 4.1)

4.7 SetUp Menu

In this Menu, there are all the commands concerning operating conditions for the main parameters of CS8030 System.

A check mark ✔ means that the command is active. All the changes done in this menu, are effectives only for the current working session. At restart, they will be deactivated. To set it in a permanent way, use the **Environment Options** command. For detailed explanation of each command please refer to Chapt.6.

The **Restore Environment Options** command restores the default values for all the parameters in the Environment Options.

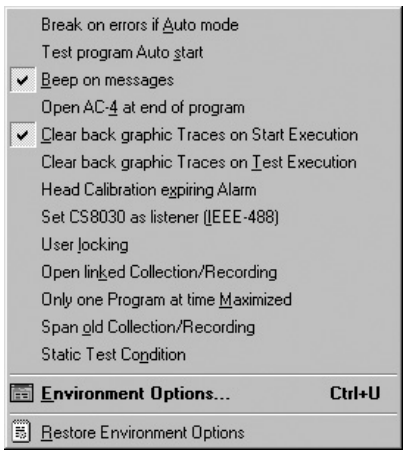

Break on errors if Auto mode
Test program Auto start
Beep on messages
Open AC-4 at end of program
Clear back graphic Traces on Start Execution
Clear back graphic Traces on Test Execution
Head Calibration expiring Alarm
Set CS8030 as listener (IEEE-488)
User locking
Open linked Collection/Recording
Only one Program at time Maximized
Span old Collection/Recording
Static Test Condition
Environment Options... Ctrl+U
Restore Environment Options

fig.4.8

4.8 Calibration Menu

In this Menu there are all the commands concerning electro-acoustical calibration of AC-3 or AC-4 Artificial Head and electrical noise calibration used to improve measurements of TE Noise Test.

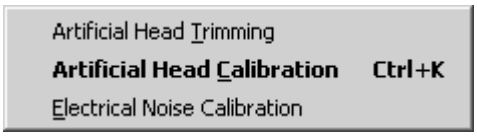


fig.4.9

This procedure is described in Chapter 12.

4.9 Collection/Recording Menu

In this Menu there are the commands concerning Collections and Recordings management (see § 10).

In the following table are shown the respective actions for all the commands in the **Collection/Recording** Menu.

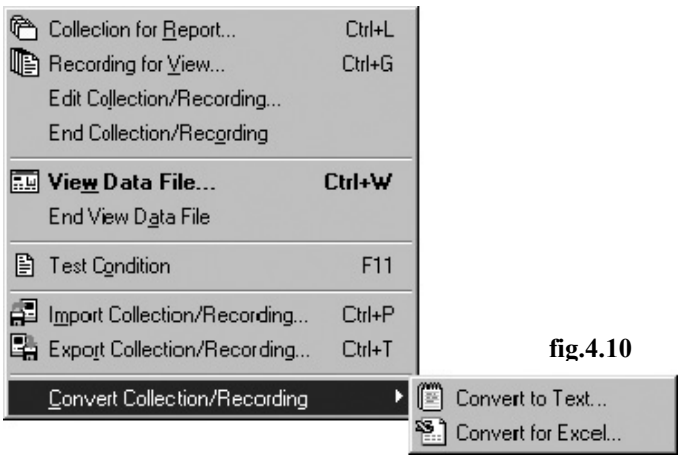


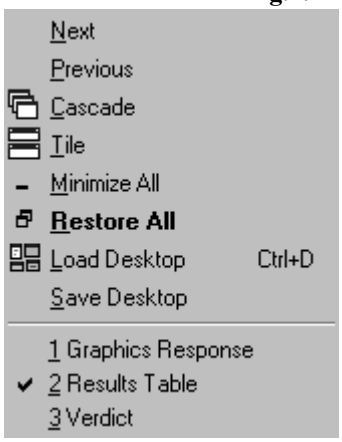
fig.4.10

Command	**Action**
Collection for Report	Open a new Collection or an existing one. This command is active only after one Test Program is opened or saved.

Recording for View	Open a new Recording or an existing one.
Edit Collection/Recording	To modify an existing Collection or Recording. This command is active only when the System is in Recording mode (see § 4.1)
End Collection/Recording	To end recording a Collection or Recording. This command is active only when the System is in Recording mode (see § 4.1)
View Data File	To view the results of one Collection or Recording. This command is not active when the System is in Recording mode (see § 4.1)
End View Data File	To end viewing of Collection or Recording's results. This command is active only when the System is in Viewing mode (see § 4.1)
Test Condition	To view the specific Test's parameters in the active Program. This command is active only when the System is in Viewing mode (see § 4.1)
Import Collection/Recording	To import from Floppy Disk a Collection or Recording. If *NET* Option is installed, it is possible to import from units connected to the network.
Export Collection/Recording	To export on Floppy Disk a Collection or Recording. If *NET* Option is installed, it is possible to export to units connected to the network.
Convert Collection/Recording	To convert the selected Collection or Recording into text or formatted file for Excel

Please note that Import and Export icons change if *NET* Option is installed.

fig.4.11



4.10 Window Menu

In the **Window** Menu, is possible to manage the arrangement and the dimension of all active windows on the screen.

At the bottom of the Menu, there is also the indication of the active window, marked by a check mark ✔ .

After sizing and arranging the windows on the screen, it is possible, with the **Save Desktop** command, save the current arrangement; to restore it later, if necessary, selecting the **Load Desktop** command or clicking on Toolbar button.

In the following table are listed the **Window** Menu choices.

Command	Action
Next	To set active the next window
Previous	To set active the previous window
Cascade	To organize the windows by stacking them on top of each other, displaying the title bar of each window. This option only works for windows that are not minimized
Tile	To organize windows into equal sized tiles. This option only works for windows that are not minimized
Minimize All	To clear off the desktop by minimizing all windows. This option only works for windows that are not minimized
Restore All	To restore the dimensions and position of all windows on the screen
Load Desktop	To load the personal setting of all the windows on the screen
Save Desktop	To save the current setting of all the windows on the screen

For the windows management, moreover, are also used **Return** and **Esc** keys. The first, maximize, while the second minimize, the active window.

4.11 Tools Menu

By this Menu is possible to view the CS8030 System resources window or Defragment the System's disk.

Disk and Memory status shows how much Virtual Memory and Hard Disk space is already in use and how much is available. The available resources are displayed in pink color.

Defrag Hard Disk command rearranges the files and free space on the Hard Disk.

4.12 Help Menu

In this Menu there are commands to enter in the On Line Help of CS8030 System.

Some of these commands are available on the Toolbar (see tab.4.1).

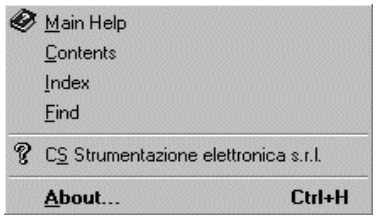


fig.4.12

In the following table are listed the **Help** Menu choices.

Command	Action
Main Help	To open the On Line Help
Contents	To view the On Line Help summary
Index	To view the key words index of On Line Help

CS Strumentazione elettronica s.r.l.	To view the telephone number and e-mail address of CS's technical support
About	To view the System serial number and the installed software version. Moreover, the serial number, the HW and FW version of AC-4 Artificial Heads connected to the System

The On Line Help contents displays a list of books, which are collections of individual help topics, grouped by subject. Double clicking on the selected book, it's possible to expand the list. Click on the topic for which are needed more information.

The index shows, in alphabetic order, the key words of On Line Help. Once selected the desired word, will be displayed all the available arguments related to it.

Some On Line Help images contain a link to other arguments. When the mouse pointer is placed over these links, it turns into a selecting cursor. Clicking on it, the On Line Help jumps directly to the desired argument or opens an information box about the selected item.

Chapter 5

TEST ORGANIZATION

5.1 Test Types

Test which can be performed with CS8030 System are grouped in families and precisely:

ACOUSTIC MEASURES – SPEECH	*speech tests*
ELECTRICAL MEASURES	*electrical tests*
DISTORTION MEASURES	*distortion tests*

Families and single tests which compose them, are described in detail on Chap.7 and followings.

5.2 Test Program

The System CS8030 memory is able to contain till 255 elementary Tests for single Program, with any sequence.

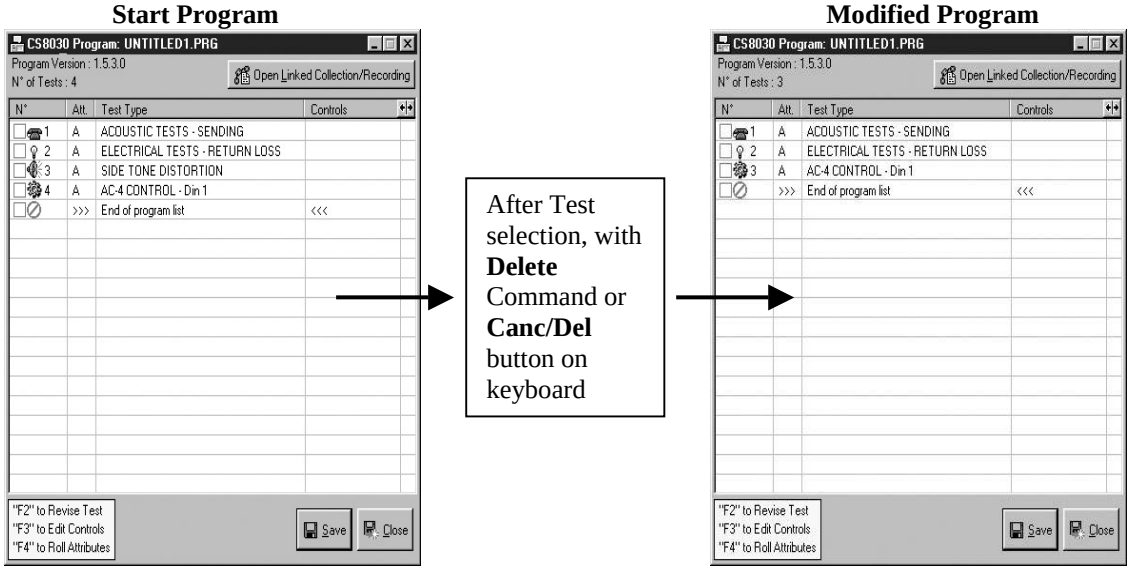
In one Program, Tests are recorded in sequence, with accessible pointer.

By mouse is possible to select in the Tests list, the sequence point on which we will operate an insertion, a modification, a deletion or a Program start.

This type of organization allows the maximum operative flexibility, particularly, having the possibility to insert new Tests and to delete others; it can obtain a program with the wished Test sequence.

Example: *Test Deleting*

Start Program **Modified Program**


CS8030 Program: UNTITLED1.PRG
Program Version : 1.5.3.0
N° of Tests : 4
Open Linked Collection/Recording
N° Att. Test Type Controls
1 A ACOUSTIC TESTS - SENDING
2 A ELECTRICAL TESTS - RETURN LOSS
3 A SIDE TONE DISTORTION
4 A AC-4 CONTROL - Din 1
>>> End of program list <<<
"F2" to Revise Test
"F3" to Edit Controls
"F4" to Roll Attributes
Save
Close
After Test selection, with **Delete** Command or **Canc/Del** button on keyboard
CS8030 Program: UNTITLED1.PRG
Program Version : 1.5.3.0
N° of Tests : 3
Open Linked Collection/Recording
N° Att. Test Type Controls
1 A ACOUSTIC TESTS - SENDING
2 A ELECTRICAL TESTS - RETURN LOSS
3 A AC-4 CONTROL - Din 1
>>> End of program list <<<
"F2" to Revise Test
"F3" to Edit Controls
"F4" to Roll Attributes
Save
Close

Selecting on the Toolbar the **New Program** function, or from **File** Menu the **New Test Program** command, will appear the window shown in figure 5.1.

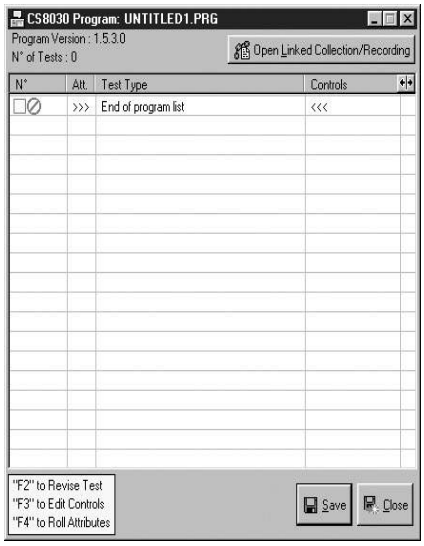


fig.5.1

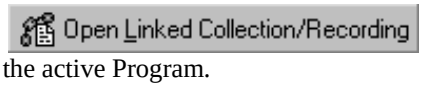
It is composed with four different columns that means:

N° - Test index and selection box for InLine Mode (see § 6.1.6)
Att. – Test attribute (see § 5.4)
Test Type –Test type (see § 5.3, § 7, § 8, § 9)
Controls – Controls setting on the result of single Test (see § 5.5)

At the bottom of the window there are two buttons:

Save – Save the active Program with the specified name and path. If the Program is already been saved at least once, save the Program with the current name and path.

Close – Close the active Program. If the Program is not already been saved after its creation or some changes, the System asks if it's necessary to save the Program.

At the top of the window there is the button 

that opens the Collection or Recording related to the active Program.

To change the Test position in the Program list, select it clicking on its icon, in the left column. Hold the left mouse button; move along the list to desired position. Releasing the button will appear a Menu with the **Copy**, **Move** or **Cancel** options.

To select more than one Test together, select the first Test moving the mouse pointer on its name (**Test Type** column); move the pointer to the last chosen Test, holding down the left mouse button. Select from **Edit** Menu the command to execute (see § 4.3).

5.3 Auxiliary Functions

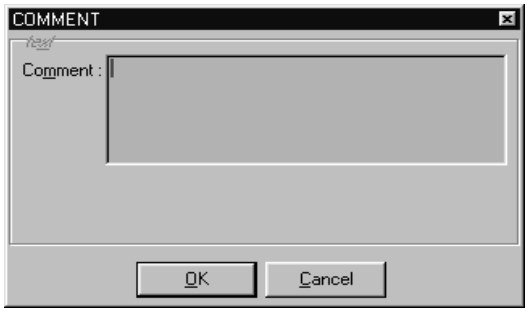
There are three auxiliary functions which are assimilated to Tests and located in the same programming menu **Tests**, in the Program **Main window**.

These functions are:

Comment	To insert comments between Program lines
Message	To insert screen messages during Program execution
AC-4 Control	For automatic control of AC-4 Artificial Head
Feeding Bridge	To control the programmable Feeding Bridge

5.3.1 Comment

fig.5.2

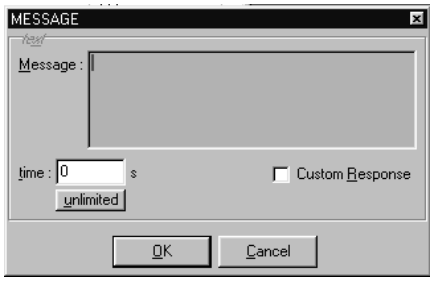


Selecting **Comment** Test, pressing the **INS** key on the keyboard or double clicking on **Tests** Menu in the **Main Menu**, appears the window of figure 5.2.

It's possible now to insert a free text, with max length of 110 characters that will appear in the Tests list at the selected point.

5.3.2 Message

fig.5.3



Selecting the Test **Message**, is possible to program messages that will be shown on screen in the selected point of Test's sequence.

It's possible to insert free text, with max length of 110 characters, select the time to display the message (expressed in seconds) or, with the button **unlimited**, let the message on the screen until Operator will decide to **Continue** or **Exit** from the Test Program.

With **Custom Response** option, the Operator can assign a PASS (positive result) or FAIL (negative result) status to the Test **Message**.

5.3.3 AC-4 Control

Selecting **AC-4 Control** Test, it's possible to program all the functions and commands about AC-4 Artificial Head that will be executed from this one during Program execution. After specifying to which System's Din port is connected the AC-4 Artificial Head, the controls are shown in table 5.1.

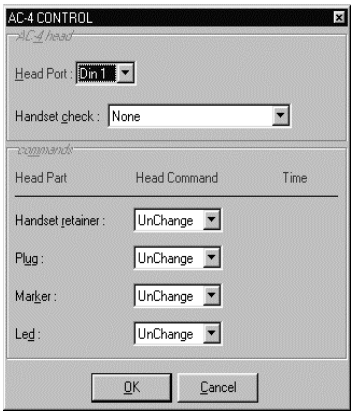


fig.5.4

CONTROLS AC-4

Handset check

None	Not performs any check on the presence of Device under Test
Wait for Presence (Hp)	Wait if there is a Device under Test in the adapter ring
Wait for Absence (Ha)	Wait if there isn't a Device under Test in the adapter ring
Wait for Presence to Absence (Hpa)	Wait release of Device under Test from the adapter ring
Wait for Absence to Presence (Hap)	Wait insertion of Device under Test in the adapter ring

tab.5.1

After a control execution, the AC-4 Artificial Head executes the specified commands.

The commands are:

tab.5.2

Head Part	Head Command	Time
Handset retainer	UnChange – The Retainer status doesn't change Open (Ro) – Open the Retainer Close (Rc) – Close the Retainer	Waiting time, expressed in seconds, before to execute the command
Plug[1]	UnChange – The plug in Cylinder status the Doesn't change Connect (Pc) – The plug in Cylinder moves forward Disconnect (Pd) – The plug in Cylinder returns to the start position	Waiting time, expressed in seconds, before to execute the command

[1] Optional

Marker[2]	UnChange – The Marker status doesn't change Out (Mo) – The Marker goes out and marks Device under Test In (Mi) – The Marker goes in Mark (Mm) – The Marker goes out and goes in a preset time	Waiting time, expressed in seconds, before to execute the command Time that Marker spends to perform a cycle
Led*	UnChange – The leds status doesn't change On-Green (Lg) – The leds lights Green On-Red (Lr) – The leds lights Red On-Yellow (Ly) – The leds lights Yellow Off (LØ) – The leds remains off	Waiting time, expressed in seconds, before to execute the command

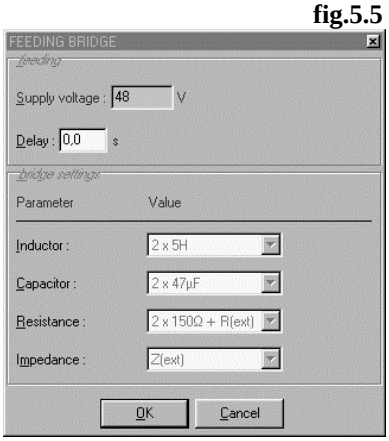
* At System startup or Program start, the leds are off. They don't change their status until is performed a Test with FAIL result (Red color) or an AC-4 Control Test that changes the led status (Green, Yellow or Red color).

To point out that the AC-4 Artificial Head is waiting for a manual action (i.e. removing Device under Test from the adapter ring), the leds blinks in the following combinations:

Blinking	**AC-4 Leds status before control**
Green	Lights off / Lights on Green or Yellow
Red	Lights on Red

All active commands and controls are displayed, through the codes in brackets (see tab 5.1), on **AC-4 Control** Test line in the Program window.

fig.5.5



5.3.4 Feeding Bridge

Selecting **Feeding Bridge** Test, it's possible to program the D.U.T. supply voltage, from +70V to –70V. Moreover. it's possible to set a delay (**Delay** – from 0÷30s) between the power supply and next Test execution.

[2] Optional

5.4 Attributes

It's possible to set an attribute to every single Test for defining its behavior during the Program performance. Attributes can be:

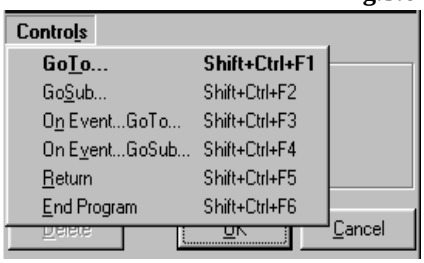
AUTO	If, during Test execution, no errors has been found, the Program passes to perform the next Test. Otherwise, there is the Program stops, and the flow control is passed to the Operator by the **Function Keys**.
STOP	Also if during Test performance, no errors have been found, the Program stops giving the flow control to the Operator by the **Function Keys**.
DISPLAY	The Program flow stops and there is the continuous Test repetition, with display refresh. The flow control is given to the Operator by the **Function Keys**. When the Program performs a Test with a DISPLAY attribute, on the Toolbar appears the icon .
EXCLUDED	The Test, however present in the Program, is not performed. The Program continues with the next Test, if present.

tab.5.3

It's possibile to set an attribute to the selected Test, simply clicking with the right mouse button sulla colonna "Att." in the Program window (see § 5.2), or pressing the **F4** key on the keyboard.

5.5 Controls

fig.5.6



It's possible to set a control on the result of a single Test.

To select a control, double click on the **Controls** field related to the selected Test, in the Program window.

Appears a dialog box. Clicking again on **Controls,** become visible the controls list (see fig. 5.6). The controls are:

GoTo…	After a Test execution, force the Program to jump to the specified Test
GoSub…	After a Test execution, the Program jumps to a specified Tests sequence (Subroutine)
On Event…GoTo…	Force the Program to jump to the specified Test, when a condition (Event) on the Test's result, is true
On Event…GoSub…	**F**orce the Program to jump to the specified Tests sequence (Subroutine), when a condition (Event) on the Test's result, is true
Return	The Program close the Tests sequence (Subroutine) called with a **GoSub…** or On **Event…GoSub…** control and jumps back to the line of Program immediately following the caller Test
End Program	End Program execution

tab.5.4

In case that Program performs a **Return** control without has passed before by a **GoSub…** or **On Event…GoSub…** control, will appear the error message "**Return without GoSub**" and the Program will continue with the next Test.

5.6 Program preparation and execution

The flow of operations, for Program preparation and execution, is divided in to the following steps:

<table>
<tr><th>Way 1</th><th>Way 2</th></tr>
<tr><td colspan="2"><u>Preparation</u></td></tr>
<tr><td><u>Create a New Program</u>

☑ Select from File Menu the New Test Program command, or click button on the Toolbar</td><td><u>Open an existing Program</u>

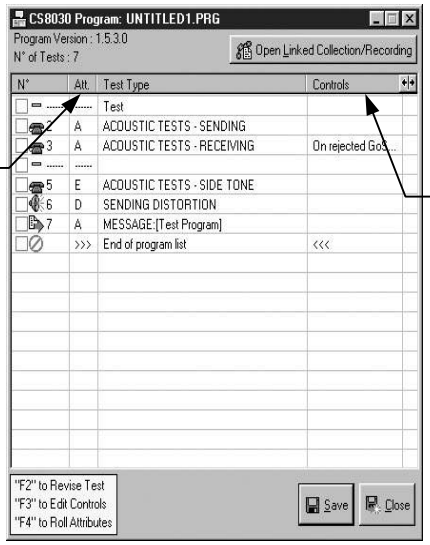
☑ Select from File Menu the Open command, or click button on the Toolbar</td></tr>
<tr><td><u>Insert Tests</u>

☑ Select from Tests Menu, the Test to insert in the Program just create</td><td><u>Modify, Delete or Add Tests</u>

☑ Select from Tests Menu, the Test to add in the Program or click on the buttons on the Toolbar, to modify the Tests sequence</td></tr>
<tr><td colspan="2"><u>Controls and Attributes Definition</u>

☑ Select an Attribute and a Control for every Test of the Program

<u>Attributes</u>:
A – Auto
S – Stop
D – Display
E – Excluded

<u>Controls:</u>
GoTo…
GoSub…
On Event…GoTo…
On Event…GoSub…
Return
End Program</td></tr>
</table>

Save Program

☑ Select from **File** Menu, the **Save** or **Save As…** command, then click on button

at the bottom of the Program window or click on button on the Toolbar

Collection for Report	*Recording for View*
☑ Select from **Collection/Recording** Menu the **Collection for Report** command. ☑ Insert the name of a new Collection or select an existing one (file extension .COL)	☑ Select from **Collection/Recording** Menu the **Recording for View** command. ☑ Insert the name of a new Recording or select an existing one (file extension .REC)
☑ Complete the Collection Form and eventually save it clicking on button at the bottom of the window	☑ Complete the Recording Form ed eventually save it clicking on button at the bottom of the window

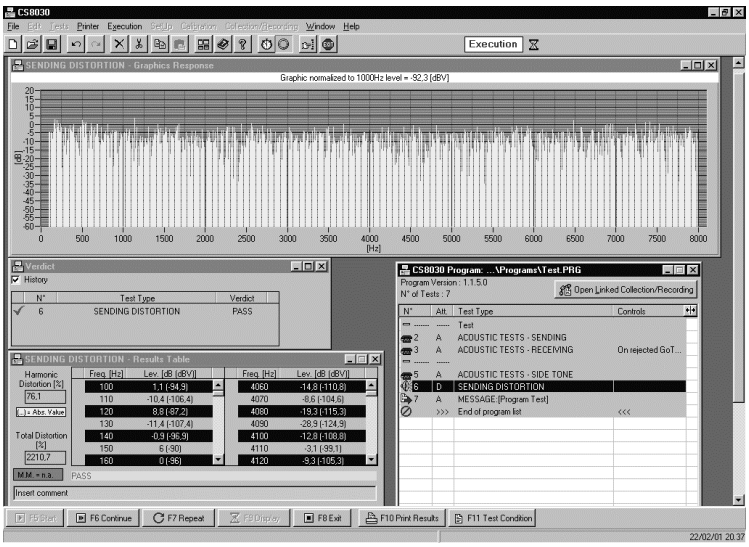
Execution

Program Execution

☑ Select from **Execution** Menu the **All Program from TOP** command, press **F5** key on keyboard or click on **Function Key** button. The icon appears on the Toolbar.

Display Results

☑ The System displays on the screen the Tests result



Print Results

☑ Select from Menu **Printer** the **Results** command, press **F10** button on keyboard or click on **Function Key** button

tab.5.5

Chapter 6

CS8030 – ENVIRONMENT OPTIONS

6.1 Environment Options

The **Environment Options** dialog box is located in the **SetUp** Menu of **Main Menu**.

By this window is possible to personalize and set the whole CS8030 System, and make it works into desired operating conditions.

Every changes made to any parameter, will take effect only after a CS8030 System restart.

In every tab, all the parameters or buttons have different properties:

➢ Combo box	Selection between listed options; the options list is visible when clicking on list arrow at the right of the item
☑ Check box	Parameter status ON/OFF; if checked, the status is ON
⊙ Radio button	Selection of only one Parameter between an options list; if selected, the status is ON
🖋 Free parameter typing	Insertion of free values by keyboard

The System displays

buttons at the bottom of every tab on the **Environment Options** dialog box.

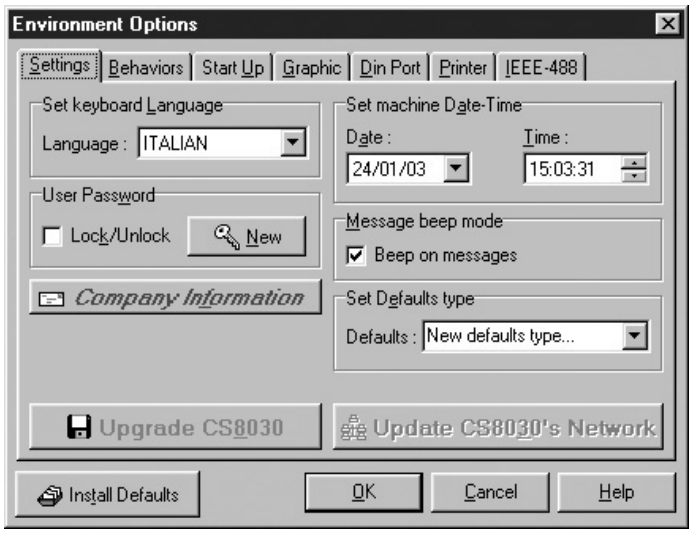
The first button allows to search and install defaults for all type of Tests, from floppy disk (and from the network, if CS8030 *NET* version). To close the dialog box and save all the changes made, press the OK button. The CANCEL button instead, close the dialog box and cancels all the changes made. The **Help** button opens the On Line Help (see § 4.12).

In the **Environment Options** dialog box**,** there are different tabs, each of them for different specific parameters.

Please, take care that the System may not function correctly if the parameter's setting is not done in the right way.

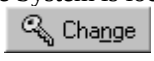
6.1.1 Settings

The **Settings** tab allows choosing the main settings of CS8030 System.
The **Settings** tab is displayed as shown as follow:



In the following sections are listed all the available options of **Settings** tab on the **Environment Options** dialog box:

Set Keyboard Language
Setting the keyboard type. ➢ ***Language*** Available options are: - English - French - German - Italian *[default]* - Spanish

User Password
Setting the Password to protect Test Programs and Calibrations. If the System is locked, anyone attempting to create and save a new Test Program or modify an existing one, must type the password. Furthermore **Calibration** Menu is disabled. To show that the System is in locking status, appears on Toolbar the locking icon . At first start up, click on button to insert a new Password. The text typed will appear as asterisks. Passwords are case-sensitive so, please, remember to type the text as originally entered it. When the System is locked, the NEW button turns into CHANGE button. Click on  button to modify an existing Password. To unlock the System or to insert a new Password, type in the User Service dialog box, the active Password. ☑ ***Lock/Unlock*** (Lock = ON) *[default=OFF]*

Company Information

Clicking on button is possible to insert the Company name and address; they will appear on screen at every CS8030 System start up, and on all the printed documents.

🖋 ***Company*** (0 ÷ 40 characters)
🖋 ***Address*** (0 ÷ 40 characters)

Set machine Date-Time

Setting Date and Time of CS8030 System.
These will be shown at the bottom of the Main Window, on the Collections, Recordings and on all printed documents.

🖋 ➢ ***Date***
🖋 ➢ ***Time***

Message beep mode

To associate with a beep sound every advice or error message that CS8030 System will shown to the Operator.

☑ ***Beep on messages*** *[default=ON]*

Upgrade CS8030

Click on button to perform the CS8030 System Upgrade.
To execute the upgrade, are needed the floppy disks supplied only by CS Strumentazione elettronica Srl.
Follow the instructions on screen to complete the upgrade.

Update CS8030's Network

Click on button to perform the update for all the CS8030 Systems connected together on the net.
Available only for CS8030 Systems NET version.

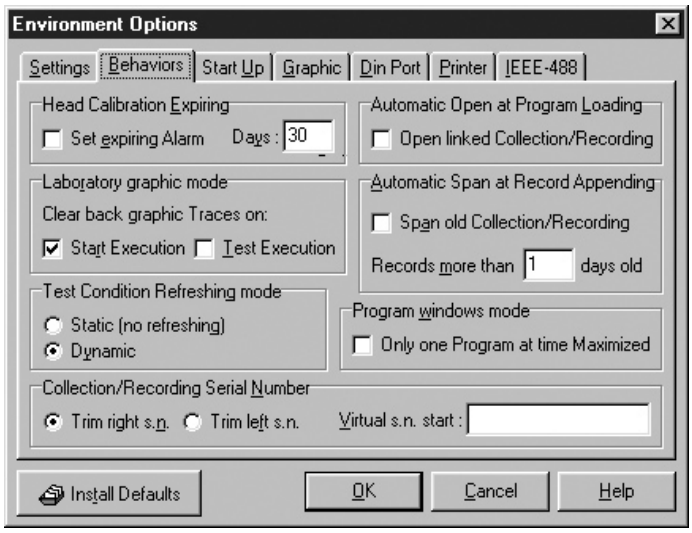
Set Defaults type

Select from list the defaults that will be loaded at System start up. These defaults will be valid for each type of Test (Receiving, Sending, etc.).
If custom defaults are created (see § 7.3, 8.2, 9.2) it's possible to save them into a folder with customizable name. Then, they will be available in the defaults list.
If you don't save the custom defaults, they will be erased at next System start up.

➢ ***Defaults*** (0 ÷ 15 chars, "? / : ; , . *" excluded)

6.1.2 Behaviors

In the **Behaviors** tab is possible to set all the advanced functions of CS8030 System.
The **Behaviors** tab is displayed as shown as follow:



In the following sections are listed all the available options of **Behaviors** tab on the **Environment Options** dialog box:

Head Calibration Expiring
To set signaling on screen of expired calibration, after a preset time period (**Days**), for the Artificial Heads used. This signaling will be shown at every System start up or access to the **Environment Options** dialog box. ☑ ***Set expiring Alarm*** *[default=OFF]* 🖋 ***Days*** (1 ÷ 365 days) *[default=30]*

Laboratory graphic mode
To erase the response curves of the previous Tests (if the option is enabled – see § 6.1.4) at Test Program start up or at selected Test start up. ☑ ***Start Execution*** *[default=ON]* ☑ ***Test Execution*** *[default=OFF]*

Test Condition Refreshing mode
To show the programming panel for the selected Test, during Test Program execution (***Static***), or show the programming panels for each Tests in the active Test Program, during their execution (***Dynamic***). ⊙ ***Static (no refreshing)*** *[default=OFF]* ⊙ ***Dynamic*** *[default=ON]*

Collection/Recording Serial Number

Restricts the D.U.T. serial number to 5 digits to the right or to the left.
Moreover, it's possible to choose the starting serial number of the Data Collection (***Virtual s.n. start***).

⊙ ***Trim right s.n.*** *[default=ON]*
⊙ ***Trim left s.n.*** *[default=OFF]*
🖋 ***Virtual s.n. start*** (1 ÷ 10 chars)

Automatic Open at program Loading

Opening a Test Program, will be displayed automatically the Collection or Recording linked to it, if they exist.
When creating a new Test Program or opening an existing one that has not a linked Collection or Recording, the System will shown a message that asks if it is necessary to create a new Data File that will be linked to the active Test Program.

☑ ***Open linked Collection/Recording*** *[default=OFF]*

Automatic Span at Record Appending

Opening a Collection already started, the System checks if the date of the last record is older then the value set by the user. If so, CS8030 creates a new folder with name "*CollectionName_date*" and inside, a new empty Collection with the same name of the original. This allows to sort the Collections by date and doesn't let to create Collections too big to be exported.

☑ ***Span old Collection/Recording*** *[default=OFF]*
🖋***Records more than ... days old*** *[default=1]*

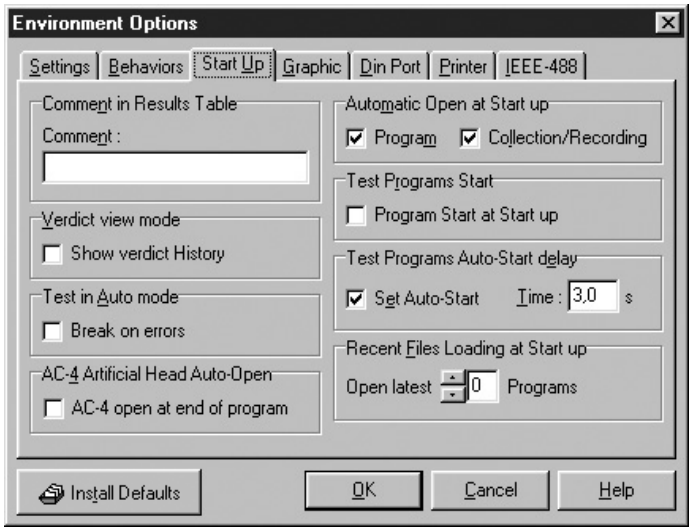
Program Windows mode

Displaying only one Test Program's window at time.
If there are open more than one Test Programs simultaneously, it minimizes the windows of not active Test Programs.

☑ ***Only one Program at time Maximized*** *[default=OFF]*

6.1.3 Start Up

The **Start Up** tab displays all the Start Up properties for CS8030 System.
The **Start Up** tab is displayed as shown as follow:



In the following sections are listed all the available options of **Start Up** tab on the **Environment Options** dialog box:

Comment in Results Table

Inserting a comment at the bottom of **Results Table** window (see § 4.1).
If the comment is inserted on the **Results Table** directly, at following System restart will be replaced with the comment set in the **Environment Options**.

🖋 ***Comment*** (0 ÷ 40 characters)

Verdict view mode

Displaying single Test's results (ACCEPTED or FAIL), of active Test Program, in the **Verdict** window (see § 4.1).

☑ ***Show verdict History*** *[default=OFF]*

Test in Auto mode

To break Test Program execution when a Test's result is FAIL and its attribute is **AUTO** (see § 4.5).
Control is passed to Operator, activating the **Function Keys** (see § 4.1).

☑ ***Break on errors*** *[default=ON]*

AC-4 Artificial Head Auto-Open

The AC-4 Artificial Head, at the end of Test Program performing, receives an open command to allow removing Device Under Test from the Artificial Head. This option is available only if an AC-4 Artificial Head is connected to the CS8030 System.

☑ ***AC-4 open at end of program*** *[default=OFF]*

Automatic Open at Start up

To automatically re-open a Test Program's window and a Recording or Collection's window linked to it, at CS8030 System start up.
At the end of work session, all the open windows actually on screen, will be re-opened and rearranged to the same positions.
If there are more Test Programs opened, only the active one before System shutdown will be re-opened.
If is not selected the ***Program*** option, automatically is disabled the ***Collection/Recording*** option.

☑ ***Program*** *[default=ON]*
☑ ***Collection/Recording*** *[default=ON]*

Test Programs Start

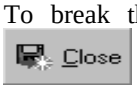
To execute automatically one Test Program at System start up.
Will be executed the last active Test Program before System shutdown.

☑ ***Program Start at Start up*** *[default=OFF]*

Test Programs Auto-Start delay

Setting continued execution of the active Test Program.
Clicking on

Function Key, the Test Program will be executed automatically and repeatedly after a delay time that can be set.
To break the Test Program execution, click on

Function Key or on 

button at the bottom of the Test Program's window (if open).

☑ ***Set Auto-Start*** *[default=OFF]*
🖋 ***Time*** (0 ÷ 60 seconds) *[default=0]*

Recent Files Loading at Start up

Automatic loading at System start up, of last used Test Programs.
These Programs are shown also at the bottom of **File** Menu.
If set to 0 and, at the System shutdown, one Program is open, at restart the Program will be reopened in any case.

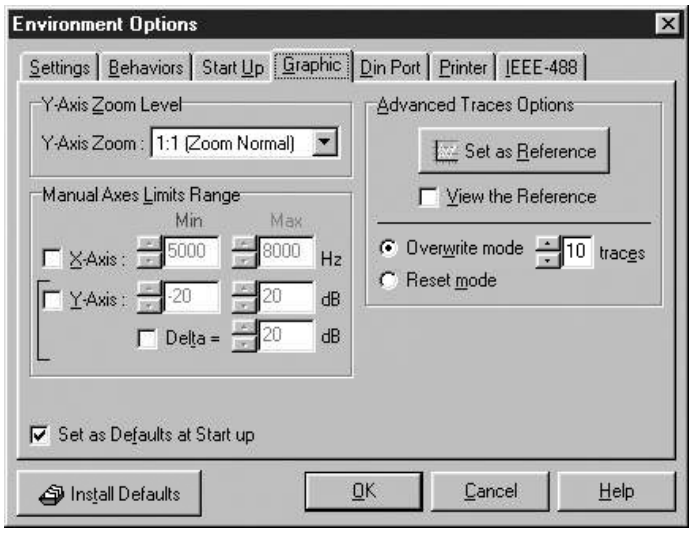
🖋 ➢ ***Open latest ... Programs*** (0 ÷ 4)

6.1.4 Graphic

In the **Graphic** tab are available all the settings about graphic representation of results gets from CS8030 System.

This tab appears only if a Test has been performed, **Test Comment** or **Test Message** excluded.

The **Graphic** tab is displayed as shown as follow:



In the following sections are listed all the available options of **Graphic** tab on the **Environment Options** dialog box:

Y-Axis Zoom Level

Setting a zoom level to display the graphic response, in the **Graphic Response** window.

➢ ***Y-Axis Zoom*** *[default=1 :1 Normal]*

Available options are:
Zoom In (2:1 ÷ 4:1)
Zoom Out (1:2 ÷ 1:3)

Manual Axes Limits Range

To set Min - Max absolute limits range for X and Y axes or the relative maximum range (***Delta***) for Y axis, displayed in the **Graphic Response** window.

☑ ***X-Axis*** *[default=OFF]*
- ➢ ***Min*** (100 ÷ 10000) *[default=100]*
- ➢ ***Max*** (100 ÷ 10000) *[default=8000]*

☑ ***Y-Axis*** *[default=OFF]*
- ➢ ***Min*** (-100 ÷ 100) *[default=-20]*
- ➢ ***Max*** (-100 ÷ 100) *[default=20]*

☑ ***Delta*** *[default=OFF]*
- ➢ ***Max*** (2 ÷ 200) *[default=20]*

Advanced Traces Options

Setting advanced options about traces displayed in the **Graphic Response** window.

Clicking on

button, or double clicking on the Graphic window, it is possible to set the last trace displayed as reference.

☑ ***View the Reference*** *[default=OFF]*

Check this option to display the reference trace. To show which is the reference, the trace is marked with a bold white line.

☑ ***Overwrite mode*** *[default=OFF]*
✍➢ ***trace*** (0 ÷ 10)

Lay last 'N' traces on the actual trace, marked by a yellow line, in the **Graphic Response** window. These traces will be marked with a thin white line, at next start up Test and will be shown only for Tests with **DISPLAY** attribute.
If this option is set to ON, automatically the ***Reset mode*** option is switched OFF.

☑ ***Reset mode*** *[default=ON]*

To display only the last trace. If this option is ON, automatically the ***Overwrite mode*** option is switch over to OFF.

Set as Defaults at Start up

The parameters set in the **Graphic** tab, are the default values at start up of a new working session.
This function is available only if the Operator enters in the **Graphic** tab by the **Properties** command, in the graphic options shortcut Menu (see § 4.1).

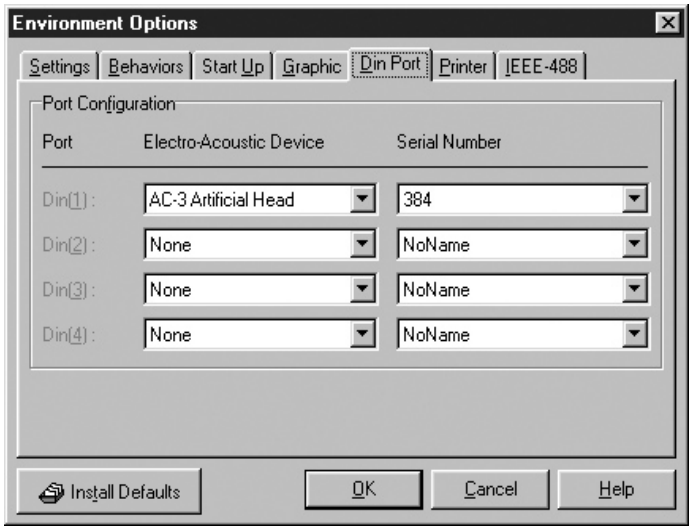
6.1.5 Din Port

In the **Din Port** tab are available all the settings about the DIN communication ports of CS8030 System.

The DIN ports are used for Speech Tests (Receiving, Sending, Side-Tone, Over-All), for Distortion Tests (Receiving, Sending, Side-Tone, Over-All) and to command AC-4 Artificial Head.
AC-4 Artificial Head, if correctly connected to a DIN port, and recognized by the System, automatically appears in the box **Electro-Acoustic Device**. It is shown in gray type, that means is not possible to select it in the available devices list.

The DIN ports, also, are used to connect CS8030 System with all the accessories, like CS2036 and CS2040 Calibrators, PH-18 Sound Level Meter, etc. (see § 3.3.2).

The **Din Port** tab is displayed as shown as follow:



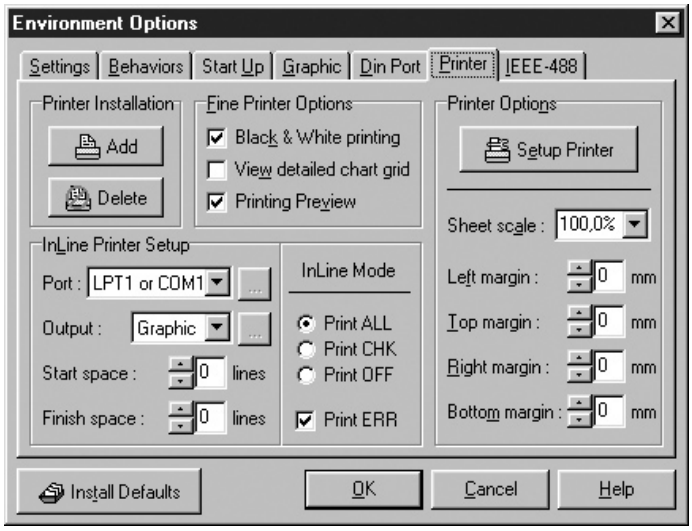
In the following section are listed all the available options of **Din Port** tab on the **Environment Options** dialog box:

Port Configuration
To set manually AC-3 Artificial Heads, CS2036/CS2040 Calibrators, PH-18 Sound Level Meter connections, or for an automatic detection of AC-4 Artificial Heads; please, take care that the selected device is connected to the DIN connector. Every time that this tab is opened, the CS8030 System performs a check for all AC-4 Artificial Heads that are present (see § 4.1). ➢ ***Electro-Acoustic Device*** Available options are: - None *[default]* - AC-3 Artificial Head - AC-4 Artificial Head - 2036 Calibrator - 2040 Calibrator - PH-18 Sound Level Meter ➢ ***Serial Number*** Selecting an AC-3 Artificial Head in the Electro-Acoustic Device list, will be shown automatically in the Serial Number list, all the serial number of Artificial Heads already calibrated.

6.1.6 Printer

The **Printer** tab allows choosing all printer settings.
Please, take care to connect the printer by the printer connector on the rear panel.

The **Printer** tab is displayed as shown as follow:



In the following sections are listed all the available options of **Printer** tab on the **Environment Options** dialog box:

Printer Installation

Clicking on

button, the **Add Printer Wizard** dialog box is displayed. Follow the instructions on the screen to install a new printer.

InLine Printer Setup

Setup of printer parameters.

➢ ***Port***

Printer port selection (see § 3.3.3).
Available options are:
- LPT1 or COM1
- printer (LPT1) – available only if ***Output-text*** is selected.
- rs232 (COM1) – available only if ***Output-text*** is selected.

If LPT1 or COM1 is selected, ***Output*** parameter is automatically switched to Graphic.
If rs232 is selected, it is possible to set up Baudrate, Parity, Data bits, Stop bits, for the serial port, pressing the button on the right of the combo box.

➢ ***Output***

Print type selection.
Available options are:
- Graphic
- Text

If Text is selected, it is possible to set up a command line for the printer or a page title, pressing the button on the right of the combo box.

✍➢ ***Start space*** (0 ÷ 50 lines)

Number of empty lines at beginning of the page.

✍➢ ***Finish space*** (0 ÷ 50 lines)

Number of empty lines at bottom of the page.

Fine Printer Options

Setting the advanced printer parameters.

☑ ***Black & White printing*** *[default=OFF]*

To print only in black and white mode, often increasing the speed at which a long document prints.

☑ ***View detailed chart grid*** *[default=OFF]*

To print all the Y grid lines on the chart. Otherwise, will be printed out only the chart grid lines that have a numeric value beside.

☑ ***Printing Preview*** *[default=OFF]*

Displaying printing preview of the current print job. Clicking on **Close** button, System returns to the desktop.

InLine Mode

Selection of Test's results to print, without table and chart, in real-time.

⊙ ***Print ALL***

Send to printer all the Test's results in the active Test Program.

⊙ ***Print CHK***

Send to printer only the results of selected Tests in the active Test Program (see § 5.2).

⊙ ***Print OFF***

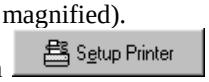
Do not send the Test's results to printer.

☑ ***Print ERR*** *[default=OFF]*

Print results of Tests with negative final result (FAIL – see § 7.5).

Printer Options

Setting the printing parameters it is possible to change the borders and the print job size (reduced or magnified).

Clicking on 

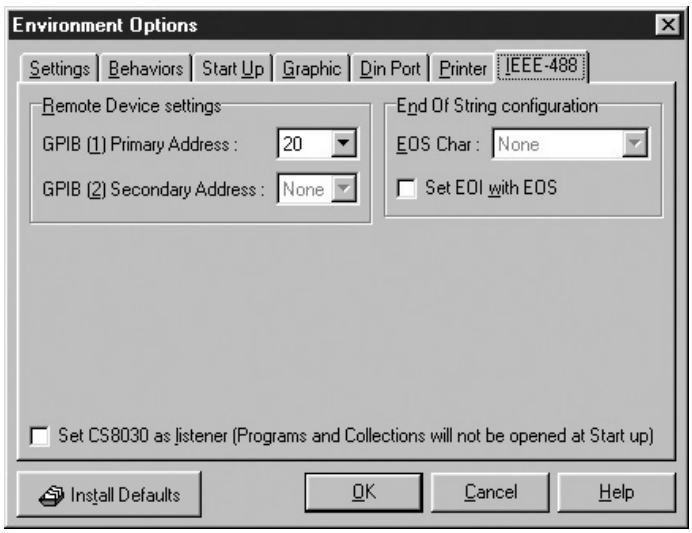
button, or selecting the **Set Up** command and **Printer…** Submenu in the **Printer** Menu is possible to enter in the **Print Setup** dialog box.

➢ ***Sheet scale*** (0 ÷ 9999,9) *[default=100,0%]*
➢ ***Left margin*** (0 ÷ 50) *[default=0]*
➢ ***Top margin*** (0 ÷ 50) *[default=0]*
➢ ***Right margin*** (0 ÷ 50) *[default=0]*
➢ ***Bottom margin*** (0 ÷ 50) *[default=0]*

6.1.7 IEEE-488

The **IEEE-488** tab displays all the settings about IEEE-488 communication port of CS8030 System.

The **IEEE-488** tab is displayed as shown as follow:



In the following sections are listed all the available options of **IEEE-488** tab on the **Environment Options** dialog box:

Remote Device settings
Allows setting CS8030's primary and secondary addresses; these addresses are used by the System to be recognized on GPIB bus. **Attention:** the System board must be set for an address that does not conflict with any other device connected on the same GPIB bus. ➢ ***GPIB (1) Primary Address*** *[default=20]* ➢ ***GPIB (2) Secondary Address*** *[default=None]- Disabled*

End Of String configuration
Setting the type of extra End-Of-String (EOS) character. All data transfer operations will automatically terminate whenever the EOS byte is received. With ***Set EOI with EOS*** parameter to ON, all write operations will automatically assert the EOI (End or Identify) line whenever the EOS byte is transmitted. For further information, please refer to the constructor's manual of Your GPIB device. ➢ ***EOS Char*** *- Disabled* Available options are: - None - Line feed *[default]* - Carriage return - Escape ☑ ***Set EOI with EOS*** *[default=OFF]- Disabled*

Set CS8030 as listener
Setting the remote command through the IEEE-488 port. If **Set CS8030 as listener** parameter is ON, a remote unit by the communication port could control the System. When the System is set as listener, will be shown on **Toolbar** the icon. ☑ ***Set CS8030 as listener*** *[default=OFF]*

Chapter 7

ACOUSTIC TESTS

"SPEECH"

7.1 Generals

Main measurements are:

Telephonometric Measure of Receiving	rx
Telephonometric Measure of Sending	tx
Telephonometric Measure of Side Tone	st
Telephonometric Measure of Over-All	oa
Telephonometric Measure of TE Noise	rx, tx, st

7.1.1 Telephonometric Measure

Internationally it is established that the efficiency measure of the conversation devices, must be performed by a relative way in respect of a device considered as Reference Standard.

For all Standards (except RMS), the measurement result is the attenuation to introduce at the IRS[1] to obtain the same auditive effect with the D.U.T.[2]. Therefore, for a D.U.T. with low efficiency, IRS must be attenuated (positive value), while for a D.U.T. with high efficiency is needed to apply a negative attenuation (gain) to IRS.

Several test methods are available for telephonometric measures; each one is in according to different Standard.

Loudness Rating[3]		ITU-T P series IEEE 269-661 AUSTRALIA TS004-1992
OREM[4]	A B CH	B&K 3356/57 DIN 44013 SR 784.103.12/2.1/1

A brief description of these methods is made in App.1.

[1] **IRS** = **I**ntermediate **R**eference **S**ystem.

[2] **D**evice **U**nder **T**est.

[3] **Loudness Rating** = Measure method for evaluation of ratio between intensity sensation and relative stimulus.

[4] **OREM** = **O**bjective **R**eference **E**quivalent **M**easurement (see CCITT Green Book – vol. V).

7.2 Principles of measure

In the CS8030 System, measures on electro acoustic devices are performed by use of F.F.T[5], which allows reaching the quickness required for a manufacturing inspection machine without loss of precision.

With CS8030 System is possible also to change the execution speed of every single Test in according to accuracy, repeatability and noise immunity that the measure requires.

Main characteristics of the System are:
1. Correspondence to various measuring Standards
2. Positioning repeatability of the D.U.T.
3. High speed of measure
4. Immunity to the environmental noise and to the conditions that usually can be found in an industrial environment.

Point 1 is met by a large capacity to program test parameters (see § 7.3) and by Artificial Head AC3/AC4 versatility, which can be positioned in any modal position.

Artificial Head structure and the use of adapter rings, meets the point 2, allowing a fast and repeatable positioning of the handset under test.

Points 3 and 4 involving the measuring method, described at § 7.2.1.

Telephonometric measures could be divided into four families:

Receiving Measure	Is sent the electrical signal (stimulus) to the D.U.T. and by AC-3/AC-4 Artificial Ear, the acoustic pressure generated by the receiver is detected.
Sending Measure	By AC-3/AC-4 Artificial Mouth, the D.U.T. microphone is stimulated by a signal with the acoustic pressure programmed. The electrical signal produced by D.U.T. is measured.
Side-Tone Measure	By AC-3/AC-4 Artificial Mouth, the D.U.T. microphone is stimulated by a signal with the acoustic pressure programmed. By Artificial Ear, the acoustic pressure is measured; this pressure comes from the receiver capsule and from the handset mechanical coupling.
Over-All Measure	By AC-3/AC-4 Artificial Mouth, is stimulated the microphone of the first D.U.T. by a signal with the acoustic pressure programmed. Then, by Artificial Ear of a second Test Head, the acoustic pressure is measured; this pressure comes from the receiver capsule of the second D.U.T.

[5] **F.F.T. F**ast **F**ourier **T**ransform – mathematical algorithm that allows obtaining the function spectrum, analyzing the function in the time domain.

7.2.1 Measuring method for "Speech" Test

On figure 7.2.1 is shown the schematic diagram of the speech measurement system.

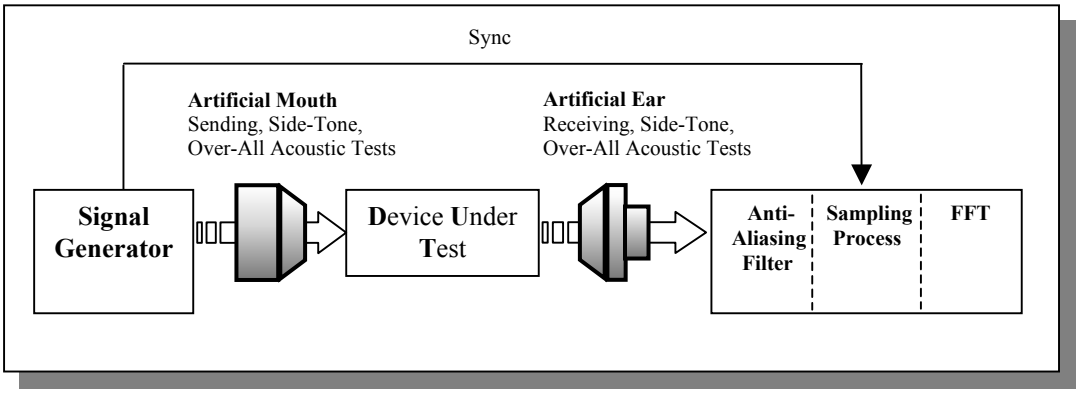


fig.7.2.1

For conversation devices or D.U.T. stimulation, composite signals are used, that are mixture of opportune frequencies of the telephone range (100÷8000 or 200÷4000Hz)[6].

For this purpose, frequencies ISO 3 – R10 and R40 series are used in according with ITU-T recommendations and other rules.

Above-mentioned signals, which spectral contents are reported on fig.7.2.2, are digitally generated and sent directly to D.U.T. (electrically or acoustically by Artificial Mouth).

The signal returned from D.U.T. is sampled in synchronism with the signal generated and averaged N times (user programmable), obtaining a voltage values series v(t), measured at constant intervals Δt.

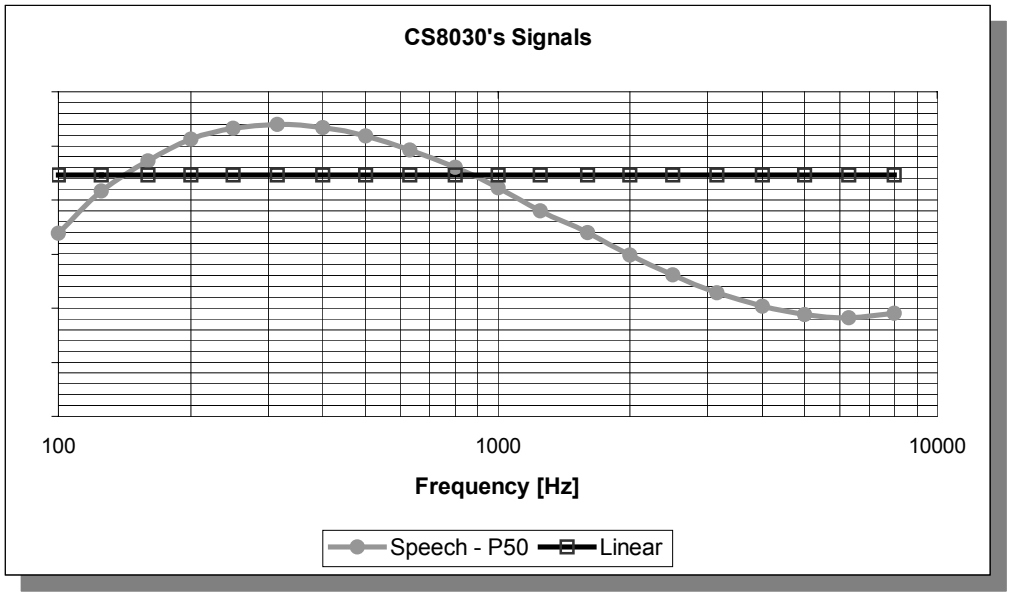


fig.7.2.2

[6] For RMS tests Gaussian Noise is used.

From the signal it is eliminated the spectrum part exceeding 8KHz (by Anti-Aliasing filter) for avoiding the lower frequencies simulation during the sampling process.

Through a F.F.T. procedure, the voltage samples series v(t) is converted in the spectrum x(f) of the analyzed signal, to obtain the amplitudes of the main frequency vectors and relevant harmonics.

D.U.T. frequency response is obtained from the elaborated spectrum x(f), and it represents a voltage response at the termination of the line or a pressure response measured by the Artificial Ear.

Two main methods for telephonometric tests are:

LOUDNESS RATING	**OREM**
Frequency response, or frequency sensitivity, is defined as the ratio between effect and stimulus. Therefore, for every spectrum frequency is: (Receiving) $S_{Je}[dB] = 20LOG\frac{P_{ear}}{(emf/2)}$ (Sending) $S_{mJ}[dB] = 20LOG\frac{V_{term}}{P_{mouth}}$ (Side-Tone) $S_{meST}[dB] = 20LOG\frac{P_{ear}}{P_{mouth}}$ (Over-All) $S_{me}[dB] = 20LOG\frac{P_{ear}}{P_{mouth}}$ where the pressures unit is Pascal and voltage unit is Volt	Frequency response is relative to the quantity under control, either voltage or pressure, in relation to reference quantity. Therefore, for every spectrum frequency is: $\mathrm{Re}ceiving[dB] = 20LOG\frac{P_{ear}}{P_{ref}}$ $Sending[dB] = 20LOG\frac{V_{term}}{V_{ref}}$ $Side-Tone[dB] = 20LOG\frac{P_{ear}}{P_{ref}}$ where the pressure P_{ref} = 1.07Pa or 94.6dB$_{SPL}$ and the voltage V_{ref}= 285mV

All this assertions are true except for corrections that come from electro-acoustic transducers used on Artificial Head.

More precisely:

Artificial Ear	**Artificial Mouth**
In the measures for which is used the Artificial Ear, the calculated response is corrected by the frequency response of the microphone used. For this purpose, the corrective data relative to the Artificial Ear's microphone are added to the spectrum x(f). These data are stored in the System memory and collected in the calibration process.	In the measures for which the stimulus is the sound pressure generated by the Artificial Mouth, the spectrum x(f) is not corrected. This is due to the particular calibration procedure (see § 12), which allows, varying the amplitude composition of the Mouth driving signal, to maintain the desired linearity at the lip ring. These signals are stored, for each Artificial Head, in the System memory and are used to drive the corresponding Mouth.

AC-3/AC-4 Artificial Head correction data must be stored in the CS8030 System before starting the acoustic measures. To load and/or update these data please refer to the procedures described on § 12.

Obtained the D.U.T. frequency response as series of N values X_f, it is calculated the quantity value, using the algorithms shown in the following table:

LOUDNESS RATING
(IS or OLR)
$$OLR[dB] = -\frac{10}{m} LOG \sum_{f=1}^{N} \left\{ 10^{-\frac{m(X_f + W_f)}{10}} \right\} + offset$$ [7]
OREM
(IER or ORE)
$$ORE[dB] = -\frac{1}{2m} 20LOG \sum_{f=1}^{N} \left\{ X_f^{2m} W_f \right\} + offset$$ [7]

Objective 4 is reached performing the sampling on the signal that returns from D.U.T., in a synchronous way with generation and averaging (user programmable).

Measures performed by this way can be considered as selective with a band pass of 0.25 ÷ 4.4 Hz[8].

[7] $\mathbf{X_f}$, $\mathbf{W_f}$ and **m** are respectively the calculated spectrum added to the calculated offset, the equalization function and the exponent of loudness growth (shown on table A1 as integration index).

[8] First value refers to measure with 16 averages while the second to measure without averaging.

7.3 Insertion of "Speech" Test

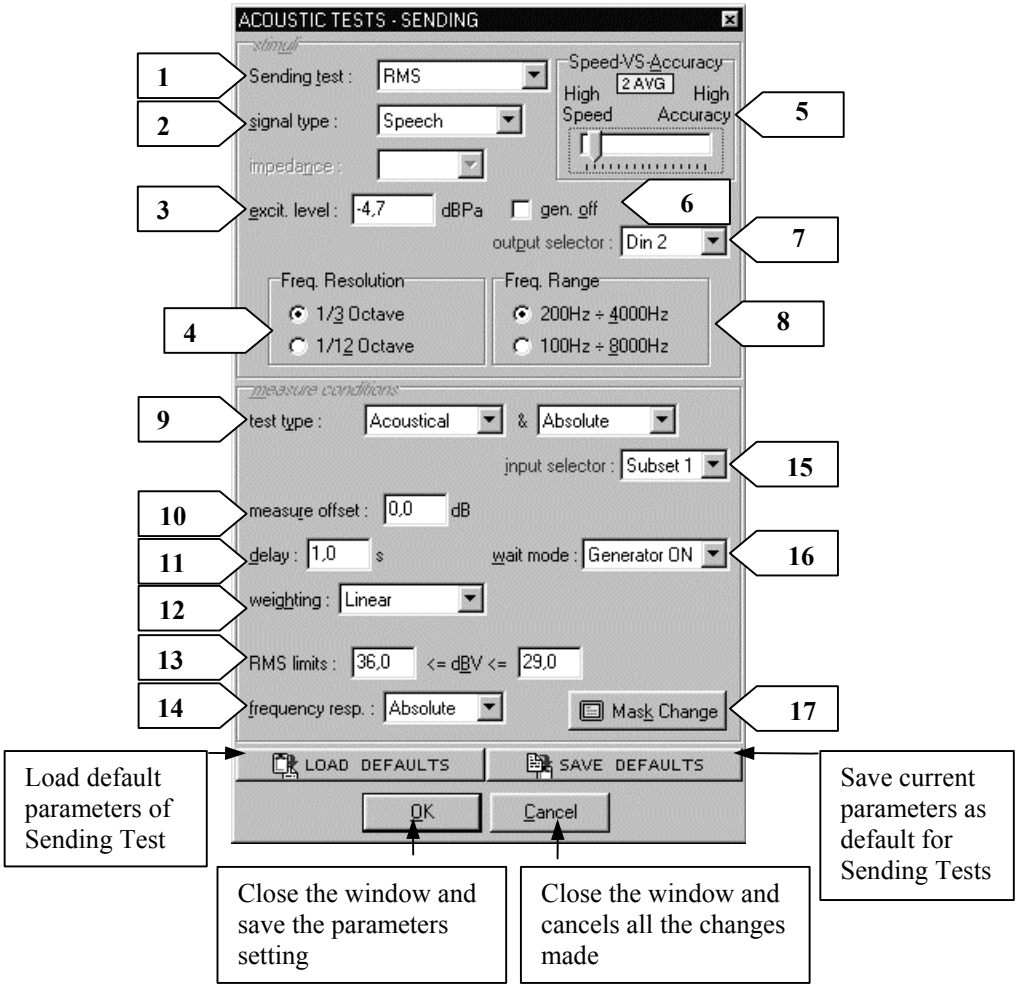
To insert a "Speech" Test in the active Test Program, select **Tests** Menu in the**Main Menu**.

Then select **Acoustic Tests**. Will be shown a list of the available Tests.

To set the parameters for each kind of "Speech" Test, please refer to the specific paragraph.

7.3.1 Sending Test

Select **Sending** Test in the **Acoustic Tests** Menu. On the screen the following window appears:



1 – Sending Test

Allows to program the Test Standard.
Available Standards are:

ITU - T (CCITT) – P79	Execution in according to ITU-T, P Series, Standard (European-CEI).
IEEE 661/269	Execution in according to USA IEEE269/661 Standard.
AUSTRALIA STD	Execution in according to Australian Standard TS004.
RMS	Execution using Gaussian noise as stimulus and measure in RMS mode; with weighting optional (A, Psophometric and Linear filter).
OREM A	Execution in according to OREM A Standard.
OREM B	Execution in according to OREM B DIN 44013 Standard.
OREM CH	Execution in according to OREM CH SR 784.103.12/2.1/1 Standard.

2 – Signal type

Signal type definition, whether electric or acoustic, to use for measurement.

Speech	Signal with spectrum like human voice in according to ITU-T P50 (see TAB1&2 App.1). Available if at **1 – Sending Test** has been selected ITU - T (CCITT) – P79, IEEE 661/269, AUSTRALIA STD.
Linear	Signal with linear spectrum – constant amplitude for all frequencies (see TAB1&2 App.1). Available if at **1 – Sending Test** has not been selected RMS.
SFERT	Acoustic signal with linear spectrum if measured with SFERT buffle. Available if programmed at **1 – Sending Test**, OREM A or OREM B Standards and at **9 - Test type** the Acoustical Test.

3 – Excit. level

Setup of Test stimulus level.
Generated signal is supplied on pin 5 and 2 (cold wire) of the selected DIN connector with output impedance equals to 600Ω.

-40.0 ÷ 11.0dBVemf (with step of 0.1dB)	For all Tests except RMS, selecting Electrical at **9 – Test type**.
-99.9 ÷ 99.9dBPa (with step of 0.1dB)	For all Tests except RMS, selecting Acoustical at **9 – Test type**.
-45.0 ÷ 6.0dBVemf (with step of 0.1dB)	Only for RMS Test, selecting Electrical at **9 – Test type**.
-39.5 ÷ 8.8dBPa (with step of 0.1dB)	Only for RMS Test, selecting Acoustical at **9 – Test type**.

4 – Freq. Resolution

Definition of measure resolution. Not available if at **1 - Sending Test** has been selected RMS.

1/3 Octave	To build up the D.U.T. frequency response are measured 20 frequencies (If at **8 -Freq. Range** has been selected 100Hz ÷ 8000Hz) or 14 frequencies (If at **8 -Freq. Range** has been selected 200Hz ÷ 4000Hz) in according to ISO 3, R10 series.
1/12 Octave	To build up the D.U.T. frequency response are measured 77 frequencies (If at **8 – Freq. Range** has been selected the 100Hz ÷ 8000Hz) or 53 frequencies (If at **8 – Freq. Range** has been selected 200Hz ÷ 4000Hz) in according to ISO 3, R40 series. Not available if programmed at **1 – Sending Test**, OREM A, OREM B or OREM CH.

5 – Speed-Vs-Accuracy

Selection of the average number to execute on the acquired signal. Higher the specified number, higher the Test execution time and environmental noise immunity will be. Moreover, the pass-band will be narrower. The programming range is **1 ÷ 16 AVG**.

6 – Generator off

Setup the generator during Test execution. If selected, the Artificial Mouth not generates any signal. Then, the programmed level at **3 – Excit. level**, will be only a reference value (Programming range –99,9 ÷ 99,9 dBVemf or dBPa, OREM A, OREM B, OREM CH and RMS Test excluded). This function is used for test on answering machines or, generally, for different Sending/Receiving Tests on the same D.U.T.

7 – Output selector

Selection of DIN connector which the AC3/AC4 Artificial Head is connected. The programming range is **Din 1 ÷ Din 4**.

8 – Freq. Range

Frequency range definition for stimuli generation. It's possible to select the restricted band **200 ÷ 4000Hz** or extended band **100 ÷ 8000Hz** (Not available if at **1 – Sending Test** has been selected OREM A, OREM B, OREM CH).

9 – Test type

Programming of measure type.

Acoustical	Preset the System to produce stimulus by Artificial Mouth. Therefore, Mouth's corrective values, obtained from Electro-Acoustic Calibration (see § 12), are considered.
Electrical	System preset to perform measurement without consider any corrective values. Measure has the equivalence 1Pa=266mV.

&

Absolute	Preset the System to show all the results in absolute units (not related with previous results obtained from Tests of the same type).
Relative	Preset the System to show the results variation (increment/decrement), related to one previous Test of the same type. The measured value comes from the formula: $VAL_{REL} = (VAL_{ASS})_{ACT} - (VAL_{ASS})_{PRE}$ where: $(VAL_{ASS})_{ACT}$ Absolute value obtained from running Test. $(VAL_{ASS})_{PRE}$ Absolute value obtained from last absolute Test of the same type performed in the same Test Program.

10 – Measure offset

Setup of measure offset level. It is added to the measured spectrum and then is subctracted to Loudness Rating or ORE, according to the selected Standard at **1 – Sending Test**. For RMS Tests is added to the measured level.
The programming range is **-100 ÷ 100dB** with steps of 0.1dB.

11 – Delay

Setup of time between power supply/stimulus signal application and measure. The programming range is **0 ÷ 30s** with steps of 0.1s. The delay time is normally used for D.U.T. stabilization.

12 – Weighting

Allows selecting the filter to weight the measured signal.
Only available if at **1 – Sending Test** item has been selected RMS Test.

Linear	No filter inserted.
A Filter	'A' filter inserted. The frequency response of this filter is the most related to human's frequency response for wide band noise.
Psophometric	Psophometric filter inserted. Normally used for acoustic noise measurements.

13 – SLR, TOLR, RMS or SRE limits

Acceptance limits definition for Loudness Rating (SLR and TOLR), RMS or SRE measured, corresponding to the selected Test at **1 – Sending Test**.

The programming range is **-100 ÷ 100dB** (**0 ÷ 100dBPa** or **dBV** for RMS Test), with steps of 0.1dB. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing.

14 – Frequency resp.

Calculus and evaluation of D.U.T. frequency response.

Floating	The D.U.T. frequency response is calculated and compared with a floating mask (see § 7.4). The mask floats vertically to contains all the frequency response. If that is not possible, an error message is displaied (see § 7.5).
Absolute	The D.U.T. frequency response is calculated and compared with a fixed mask (see § 7.4). If the measure is out of the mask limits, an error message is displaied.
Off	The D.U.T. frequency response is calculated but is not compared with any acceptance mask.

15 – Input selector

Selection of the SUBSET connector to which the D.U.T. is connected. The programming range is **Subset 1 ÷ Subset 4**.

16 – Wait mode

Definition of generator state during delay time. Only available after setting a value more than 0s at **11 – Delay**.

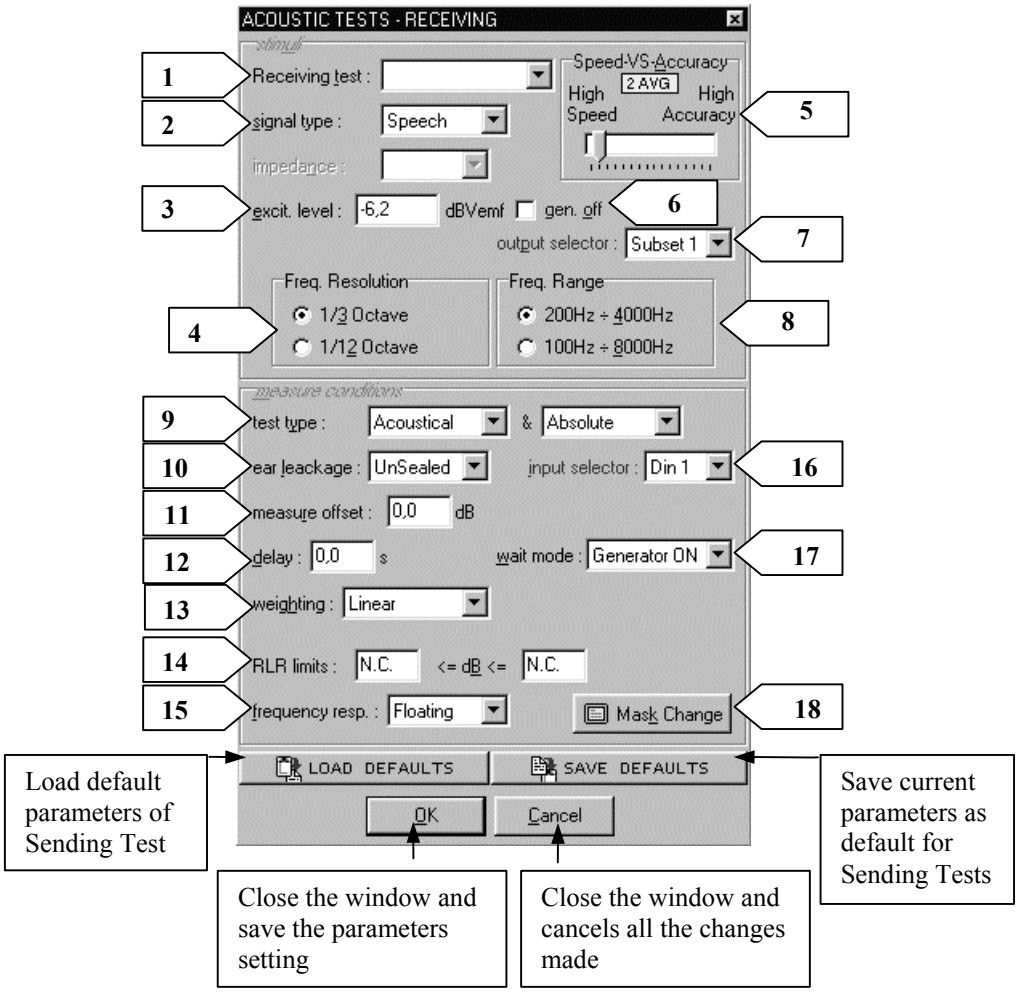
Generator ON	Generator ON during delay. Tipically used for circuit stabilization.
Generator OFF	Generator OFF during delay.
4Hz Burst	Burst Test signal at 4Hz (125ms ON - 125ms OFF). Tipically used for hands free measurements, or generally, to avoid the automatic level regulation circuits intervention.

17 – Mask Change

Enabled only if Absolute or Floating has been selected at **14 - Frequency resp**.
See § 7.4.

7.3.2 Receiving Test

Select **Receiving** Test in the **Acoustic Tests** Menu. On the screen the following window appears:



1 – Receiving Test

Allows to program the Test Standard. Available Standards are:

ITU - T (CCITT) – P79	Execution in according to ITU-T, P Series, Standard (European-CEI).
IEEE 661/269	Execution in according to USA IEEE269/661 Standard.
AUSTRALIA STD	Execution in according to Australian Standard TS004.
RMS	Execution using Gaussian noise as stimulus and measure in RMS mode; with weighting optional (A, Psophometric and Linear filter).
OREM A	Execution in according to OREM A Standard.
OREM B	Execution in according to OREM B DIN 44013 Standard.
OREM CH	Execution in according to OREM CH SR 784.103.12/2.1/1 Standard.

2 – Signal type

Signal type definition, whether electric or acoustic, to use for measurement.

Speech	Signal with spectrum like human voice in according to ITU-T P50 (see TAB1&2 App.1). Available if at **1 – Receiving Test** has been selected ITU - T (CCITT) – P79, IEEE 661/269, AUSTRALIA STD.
Linear	Signal with linear spectrum – constant amplitude for all frequencies (see TAB1&2 App.1). Available if at **1 – Receiving Test** has not been selected RMS.

3 – Excit. level

Setup of Test stimulus level.

The output impedance must be connected to Z_{out} terminals on the rear panel (see § 3.3.2).

Generated signal is supplied on pin 1 and 2 (cold wire) of the selected SUBSET connector with Z_{out}=0.

-40.0 ÷ 11.0dBVemf (with step of 0.1dB)	For all Tests except RMS
-45.0 ÷ 6.0dBVemf (with step of 0.1dB)	Only for RMS Test

4 – Freq. Resolution

Definition of measure resolution. Not available if at **1 - Receiving Test** has been selected RMS.

1/3 Octave	To build up the D.U.T. frequency response are measured 20 frequencies (If at **8 -Freq. Range** has been selected 100Hz ÷ 8000Hz) or 14 frequencies (If at **8 -Freq. Range** has been selected 200Hz ÷ 4000Hz) in according to ISO 3, R10 series.
1/12 Octave	To build up the D.U.T. frequency response are measured 77 frequencies (If at **8 – Freq. Range** has been selected the 100Hz ÷ 8000Hz) or 53 frequencies (If at **8 – Freq. Range** has been selected 200Hz ÷ 4000Hz) in according to ISO 3, R40 series. Not available if programmed at **1 - Receiving Test**, OREM A, OREM B or OREM CH.

5 – Speed-Vs-Accuracy

Selection of the average number to execute on the acquired signal. Higher the specified number, higher the Test execution time and environmental noise immunity will be. Moreover, the pass-band will be narrower. The programming range is **1 ÷ 16 AVG**.

6 – Generator off

Setup the generator during Test execution. If selected, the Artificial Mouth not generates any signal. Then, the programmed level at **3 – Excit. level**, will be only a reference value (Programming range –99,9 ÷ 99,9 dBVemf or dBPa, OREM A, OREM B, OREM CH and RMS Test excluded). This function is used for test on answering machines or, generally, for different Sending/Receiving Tests on the same D.U.T.

7 – Output selector

Selection of SUBSET connector which the D.U.T.is connected. The programming range is **Subset 1 ÷ Subset 4**.

8 – Freq. Range

Frequency range definition for stimuli generation. It's possible to select the restricted band **200 ÷ 4000Hz** or extended band **100 ÷ 8000Hz** (Not available if at **1 – Receiving Test** has been selected OREM A, OREM B, OREM CH).

9 – Test type

Programming of measure type.

Acoustical	Preset the System to perform measurement by Artificial Ear. Therefore, Microphone's corrective values, obtained from Electro-Acoustic Calibration (see § 12), are considered.
Electrical	System preset to perform measurement without consider any corrective values. Measure has the equivalence 1Pa=266mV.

&

Absolute	Preset the System to show all the results in absolute units (not related with previous results obtained from Tests of the same type).
Relative	Preset the System to show the results variation (increment/decrement), related to one previous Test of the same type. The measured value comes from the formula: $VAL_{REL} = (VAL_{ASS})_{ACT} - (VAL_{ASS})_{PRE}$ where: $(VAL_{ASS})_{ACT}$ Absolute value obtained from running Test. $(VAL_{ASS})_{PRE}$ Absolute value obtained from last absolute Test of the same type performed in the same Test Program.

10 – Ear leackage

Equalization type for Artificial Ear. Displaied only if at **1 – Receiving Test** has been selected ITU - T (CCITT) – P79 Standard.

Sealed	The Artificial Ear is considered acoustically sealed.
UnSealed	The Artificial Ear is considered acoustically unsealed. The compensation curve is added to the response to calculate the Loudness Rating.

11 – Measure offset

Setup of measure offset level. It is added to the measured spectrum and then is subctracted to Loudness Rating or ORE, according to the selected Standard at **1 – Receiving Test**. For RMS Tests is added to the measured level.
The programming range is **-100 ÷ 100dB** with steps of 0.1dB.

12 – Delay

Setup of time between power supply/stimulus signal application and measure. The programming range is **0 ÷ 30s** with steps of 0.1s. The delay time is normally used for D.U.T. stabilization.

13 – Weighting

Allows selecting the filter to weight the measured signal.
Only available if at **1 – Receiving Test** item has been selected RMS Test.

Linear	No filter inserted.
A Filter	'A' filter inserted. The frequency response of this filter is the most related to human's frequency response for wide band noise.
Psophometric	Psophometric filter inserted. Normally used for acoustic noise measurements.

14 – RLR, ROLR, RMS or RRE limits

Acceptance limits definition for Loudness Rating (SLR and TOLR), RMS or SRE measured, corresponding to the selected Test at **1 – Receiving Test**.

The programming range is **-100 ÷ 100dB** (**0 ÷ 100dBPa** or **dBV** for RMS Test), with steps of 0.1dB. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing.

15 – Frequency resp.

Calculus and evaluation of D.U.T. frequency response.

Floating	The D.U.T. frequency response is calculated and compared with a floating mask (see § 7.4). The mask floats vertically to contains all the frequency response. If that is not possible, an error message is displaied (see § 7.5).
Absolute	The D.U.T. frequency response is calculated and compared with a fixed mask (see § 7.4). If the measure is out of the mask limits, an error message is displaied.
Off	The D.U.T. frequency response is calculated but is not compared with any acceptance mask.

16 – Input selector

Selection of the DIN connector to which the AC3/AC4 Artificial Head, or other measurement system, is connected. The programming range is **Din 1 ÷ Din 4**.

17 – Wait mode

Definition of generator state during delay time. Only available after setting a value more than 0s at **12 – Delay**.

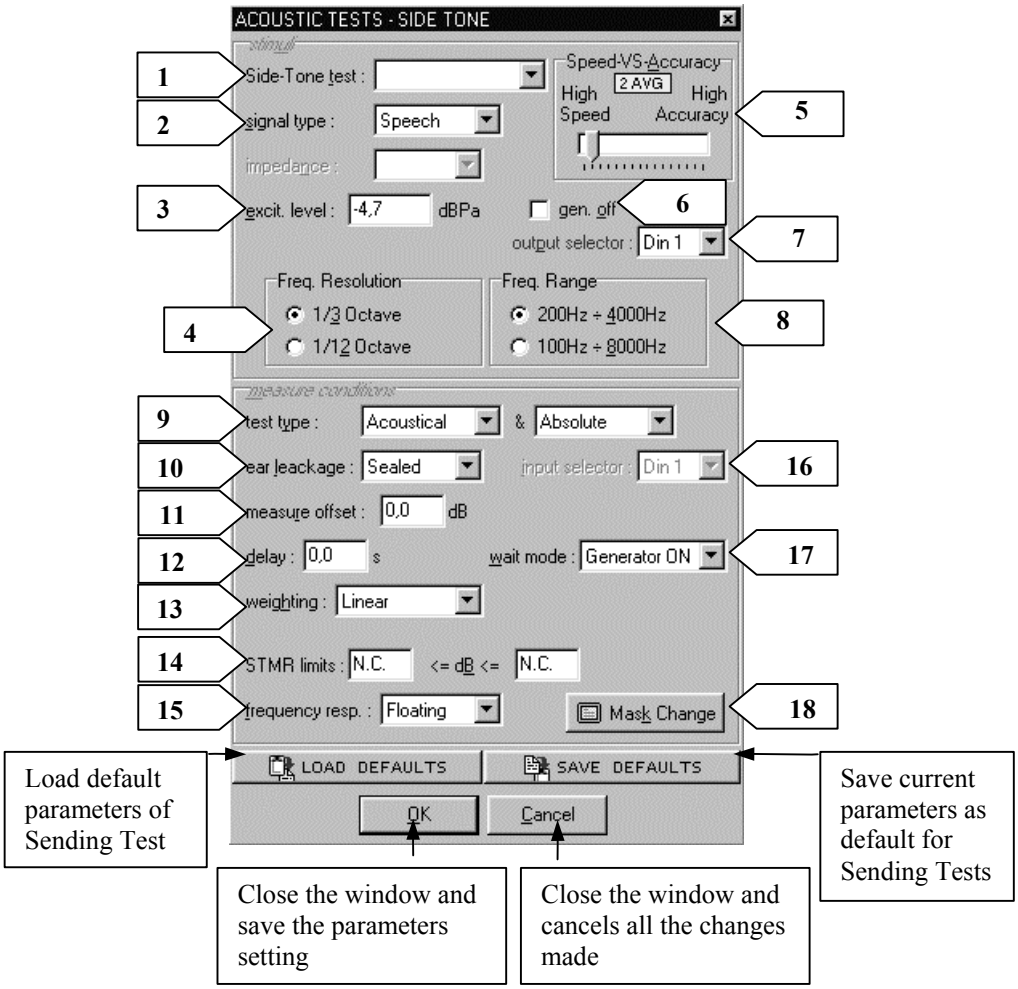
Generator ON	Generator ON during delay. Tipically used for circuit stabilization.
Generator OFF	Generator OFF during delay.
4Hz Burst	Burst Test signal at 4Hz (125ms ON - 125ms OFF). Tipically used for hands free measurements, or generally, to avoid the automatic level regulation circuits intervention.

18 – Mask Change

Enabled only if Absolute or Floating has been selected at **14 - Frequency resp**.
See § 7.4.

7.3.3 Side Tone Test

Select **Side Tone** Test in the **Acoustic Tests** Menu. On the screen appears the following window:



1 – Side-Tone Test

Allows to program the Test Standard. Available Standards are:

ITU - T (CCITT) – P79	Execution in according to ITU-T, P Series, Standard (European-CEI).
IEEE 661/269	Execution in according to USA IEEE269/661 Standard.
AUSTRALIA STD	Execution in according to Australian Standard TS004.
RMS	Execution using Gaussian noise as stimulus and measure in RMS mode; with weighting optional (A, Psophometric and Linear filter).
OREM A	Execution in according to OREM A Standard.
OREM B	Execution in according to OREM B DIN 44013 Standard.
OREM CH	Execution in according to OREM CH SR 784.103.12/2.1/1 Standard.

2 – Signal type

Signal type definition, whether electric or acoustic, to use for measurement.

Speech	Signal with spectrum like human voice in according to ITU-T P50 (see TAB1&2 App.1). Available if at **1 – Side-Tone Test** has been selected ITU - T (CCITT) – P79, IEEE 661/269, AUSTRALIA STD.
Linear	Signal with linear spectrum – constant amplitude for all frequencies (see TAB1&2 App.1). Available if at **1 – Side-Tone Test** has not been selected RMS.
SFERT	Acoustic signal with linear spectrum if measured with SFERT buffle. Available if programmed at **1 – Side-Tone Test**, OREM A or OREM B Standards and at **9 - Test type** the Acoustical Test.

3 – Excit. level

Setup of Test stimulus level.
Generated signal is supplied on pin 5 and 2 (cold wire) of the selected DIN connector.
The response signal is measured between pin 4 and 2.

-40.0 ÷ 11.0dBVemf (with step of 0.1dB)	If at **9 – Test type** has been selected Electrical and at **1 – Side-Tone Test** has not been selected RMS.
-34,5 ÷ 13.8dBPa (with step of 0.1dB)	If at **9 – Test type** has been selected Acoustical and at **1 – Side-Tone Test** has not been selected RMS.
-45.0 ÷ 6.0dBVemf (with step of 0.1dB)	If at **9 – Test type** has been selected Electrical and at **1 – Side-Tone Test** has been selected RMS.
-39.5 ÷ 8.8dBPa (with step of 0.1dB)	If at **9 – Test type** has been selected Acoustical and at **1 – Side-Tone Test** has been selected RMS.

4 – Freq. Resolution

Definition of measure resolution. Not available if at **1 – Side-Tone Test** has been selected RMS.

1/3 Octave	To build up the D.U.T. frequency response are measured 20 frequencies (If at **8 -Freq. Range** has been selected 100Hz ÷ 8000Hz) or 14 frequencies (If at **8 -Freq. Range** has been selected 200Hz ÷ 4000Hz) in according to ISO 3, R10 series.
1/12 Octave	To build up the D.U.T. frequency response are measured 77 frequencies (If at **8 – Freq. Range** has been selected the 100Hz ÷ 8000Hz) or 53 frequencies (If at **8 – Freq. Range** has been selected 200Hz ÷ 4000Hz) in according to ISO 3, R40 series. Not available if programmed at **1 – Side-Tone Test**, OREM A, OREM B or OREM CH.

5 – Speed-Vs-Accuracy

Selection of the average number to execute on the acquired signal. Higher the specified number, higher the Test execution time and environmental noise immunity will be. Moreover, the pass-band will be narrower. The programming range is **1 ÷ 16 AVG**.

6 – Generator off

Setup the generator during Test execution. If checked, the selected DIN connector at **7 – Output selector** not generates any signal. Then, the programmed level at **3 – Excit. level**, will be only a reference value (Programming range –99,9 ÷ 99,9 dBVemf or dBPa, OREM A, OREM B, OREM CH and RMS Test excluded). This function is used for test on answering machines or, generally, for different Sending/Receiving Tests on the same D.U.T.

7 – Output selector

Selection of DIN connector which the D.U.T. is connected. The programming range is **Din 1 ÷ Din 4**.

8 – Freq. Range

Frequency range definition for stimuli generation. It's possible to select the restricted band **200 ÷ 4000Hz** or extended band **100 ÷ 8000Hz** (Not available if at **1 – Side-Tone Test** has been selected OREM A, OREM B, OREM CH).

9 – Test type

Programming of measure type.

Acoustical	Preset the System to perform measurement by Artificial Ear and produce stimulus by Artificial Mouth. Therefore, Microphone and Mouth's corrective values, obtained from Electro-Acoustic Calibration (see § 12), are considered.
Electrical	System preset to perform measurement without consider any corrective values. Measure has the equivalence 1Pa=266mV.

&

Absolute	Preset the System to show all the results in absolute units (not related with previous results obtained from Tests of the same type).
Relative	Preset the System to show the results variation (increment/decrement), related to one previous Test of the same type. The measured value comes from the formula: $VAL_{REL} = (VAL_{ASS})_{ACT} - (VAL_{ASS})_{PRE}$ where: $(VAL_{ASS})_{ACT}$ Absolute value obtained from running Test. $(VAL_{ASS})_{PRE}$ Absolute value obtained from last absolute Test of the same type performed in the same Test Program.

10 – Ear leackage

Equalization type for Artificial Ear. Displaied only if at **1 – Receiving Test** has been selected ITU - T (CCITT) – P79 Standard.

Sealed	The Artificial Ear is considered acoustically sealed.
UnSealed	The Artificial Ear is considered acoustically unsealed. The compensation curve is added to the response to calculate the Loudness Rating.

11 – Measure offset

Setup of measure offset level. It is added to the measured spectrum and then is subctracted to Loudness Rating or ORE, according to the selected Standard at **1 – Receiving Test**. For RMS Tests is added to the measured level.

The programming range is **-100 ÷ 100dB** with steps of 0.1dB.

12 – Delay

Setup of time between power supply/stimulus signal application and measure. The programming range is **0 ÷ 30s** with steps of 0.1s. The delay time is normally used for D.U.T. stabilization.

13 – Weighting

Allows selecting the filter to weight the measured signal.

Only available if at **1 – Receiving Test** item has been selected RMS Test.

Linear	No filter inserted.
A Filter	'A' filter inserted. The frequency response of this filter is the most related to human's frequency response for wide band noise.
Psophometric	Psophometric filter inserted. Normally used for acoustic noise measurements.

14 – STMR/SOLR/RMS/STRE limits

Acceptance limits definition for Loudness Rating (RLR and ROLR), RMS or RRE measured, corresponding to the selected Test at **1 – Side-Tone Test**.

The programming range is **-100 ÷ 100dB** (**0 ÷ 100dBPa** or **dBV** for RMS Test), with steps of 0.1dB. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing.

15 – Frequency resp.

Calculus and evaluation of D.U.T. frequency response.

Floating	The D.U.T. frequency response is calculated and compared with a floating mask (see § 7.4). The mask floats vertically to contains all the frequency response. If that is not possible, an error message is displaied (see § 7.5).
Absolute	The D.U.T. frequency response is calculated and compared with a fixed mask (see § 7.4). If the measure is out of the mask limits, an error message is displaied.
Off	The D.U.T. frequency response is calculated but is not compared with any acceptance mask.

16 – Input selector

Selection of the DIN connector to which the AC3/AC4 Artificial Head, or other measurement system, is connected. It's the same port programmed at **7 – Output selector**.

17 – Wait mode

Definition of generator state during delay time. Only available after setting a value more than 0s at **12 – Delay**.

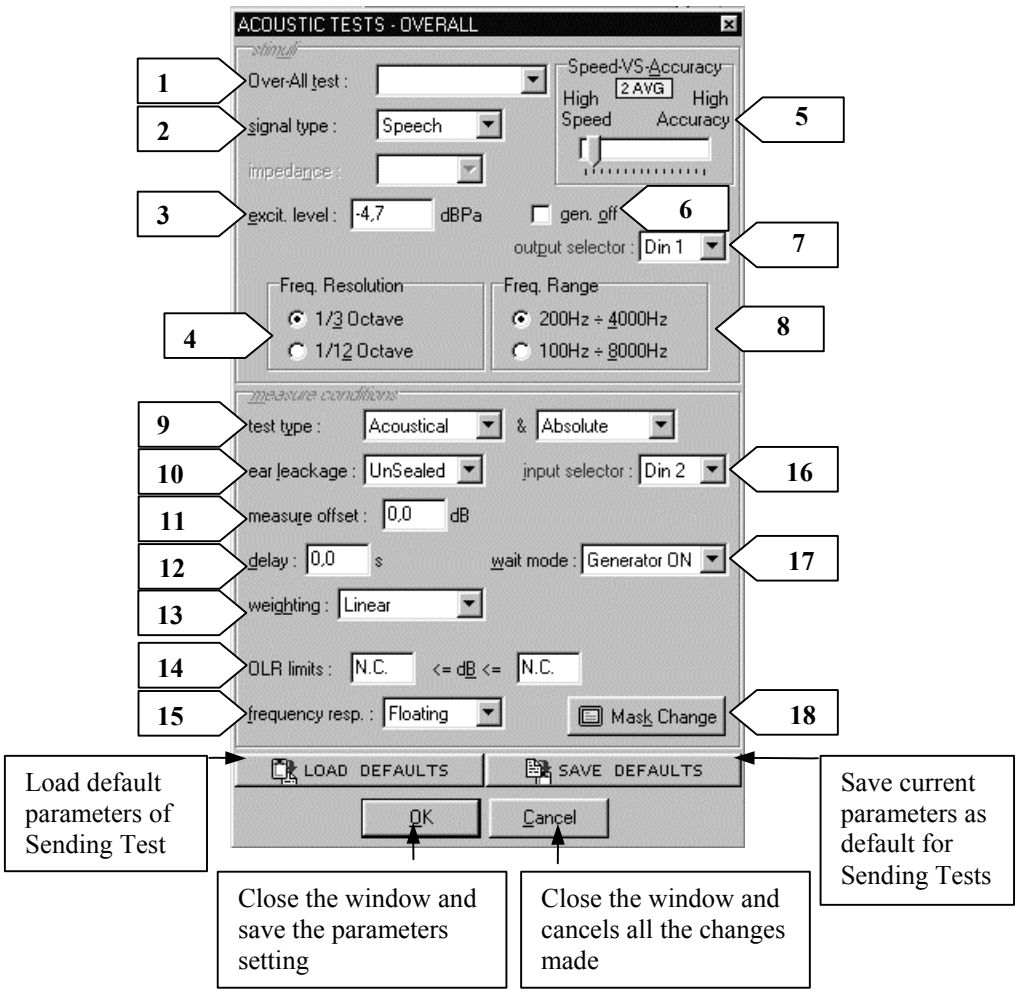
Generator ON	Generator ON during delay. Tipically used for circuit stabilization.
Generator OFF	Generator OFF during delay.
4Hz Burst	Burst Test signal at 4Hz (125ms ON - 125ms OFF). Tipically used for hands free measurements, or generally, to avoid the automatic level regulation circuits intervention.

18 – Mask Change

Enabled only if Absolute or Floating has been selected at **14 - Frequency resp**.
See § 7.4.

7.3.4 Over-All Test

Select **Over-All** Test in the **Acoustic Tests** Menu. On the screen appears the following window:



1 – Over-All Test

Allows to program the Test Standard.
Available Standards are:

ITU - T (CCITT) – P79	Execution in according to ITU-T, P Series, Standard (European-CEI).
RMS	Execution using Gaussian noise as stimulus and measure in RMS mode; with weighting optional (A, Psophometric and Linear filter).

2 – Signal type

Signal type definition, whether electric or acoustic, to use for measurement.

Speech	Signal with spectrum like human voice in according to ITU-T P50 (see TAB1&2 App.1). Available if at **1 – Over-All Test** has been selected ITU - T (CCITT) – P79, IEEE 661/269, AUSTRALIA STD.
Linear	Signal with linear spectrum – constant amplitude for all frequencies (see TAB1&2 App.1). Available if at **1 – Over-All Test** has not been selected RMS.

3 – Excit. level

Setup of Test stimulus level.

The signal is supllied by pin 5 and pin 2 (cold wire) of **7 – Output selector** and measured by pin 4 and pin 2 (cold wire) of **16 – Input selector**.

-40.0 ÷ 11.0dBVemf (with step of 0.1dB)	If at **9 – Test type** has been selected Electrical and at **1 – Over-All Test** has been selected ITU - T (CCITT) – P79.
-34,5 ÷ 13.8dBPa (with step of 0.1dB)	If at **9 – Test type** has been selected Acoustical and at **1 – Over-All Test** has been selected ITU - T (CCITT) – P79.
-45.0 ÷ 6.0dBVemf (with step of 0.1dB)	If at **9 – Test type** has been selected Electrical and at **1 – Over-All Test** has been selected RMS.
-39.5 ÷ 8.8dBPa (with step of 0.1dB)	If at **9 – Test type** has been selected Acoustical and at **1 – Over-All Test** has been selected RMS.

4 – Freq. Resolution

Definition of measure resolution. Not available if at **1 – Over-All Test** has been selected RMS.

1/3 Octave	To build up the D.U.T. frequency response are measured 20 frequencies (If at **8 -Freq. Range** has been selected 100Hz ÷ 8000Hz) or 14 frequencies (If at **8 -Freq. Range** has been selected 200Hz ÷ 4000Hz) in according to ISO 3, R10 series.
1/12 Octave	To build up the D.U.T. frequency response are measured 77 frequencies (If at **8 – Freq. Range** has been selected the 100Hz ÷ 8000Hz) or 53 frequencies (If at **8 – Freq. Range** has been selected 200Hz ÷ 4000Hz) in according to ISO 3, R40 series.

5 – Speed-Vs-Accuracy

Selection of the average number to execute on the acquired signal. Higher the specified number, higher the Test execution time and environmental noise immunity will be. Moreover, the pass-band will be narrower. The programming range is **1 ÷ 16 AVG**.

6 – Generator off

Setup the generator during Test execution. If checked, the selected DIN connector at **7 – Output selector** not generates any signal. Then, the programmed level at **3 – Excit. level**, will be only a reference value (Programming range –99,9 ÷ 99,9 dBVemf or dBPa, RMS Test excluded). This function is used for test on answering machines or, generally, for different Sending/Receiving Tests on the same D.U.T.

7 – Output selector

Selection of DIN connector which the signal generator (AC3/AC4 Artrificial Head or other equipment). is connected. The programming range is **Din 1 ÷ Din 4**.

8 – Freq. Range

Frequency range definition for stimuli generation. It's possible to select the restricted band **200 ÷ 4000Hz** or extended band **100 ÷ 8000Hz**.

9 – Test type

Programming of measure type.

Acoustical	Preset the System to perform measurement by Artificial Ear and produce stimulus by Artificial Mouth. Therefore, Microphone and Mouth's corrective values, obtained from Electro-Acoustic Calibration (see § 12), are considered.
Electrical	System preset to perform measurement without consider any corrective values. Measure has the equivalence 1Pa=266mV.

&

Absolute	Preset the System to show all the results in absolute units (not related with previous results obtained from Tests of the same type).
Relative	Preset the System to show the results variation (increment/decrement), related to one previous Test of the same type. The measured value comes from the formula: $VAL_{REL} = (VAL_{ASS})_{ACT} - (VAL_{ASS})_{PRE}$ where: $(VAL_{ASS})_{ACT}$ Absolute value obtained from running Test. $(VAL_{ASS})_{PRE}$ Absolute value obtained from last absolute Test of the same type performed in the same Test Program.

10 – Ear leackage

Equalization type for Artificial Ear. Displaied only if at **1 – Over-All Test** has been selected ITU - T (CCITT) – P79 Standard.

Sealed	The Artificial Ear is considered acoustically sealed.
UnSealed	The Artificial Ear is considered acoustically unsealed. The compensation curve is added to the response to calculate the Loudness Rating.

11 – Measure offset

Setup of measure offset level. It is added to the measured spectrum and then is subctracted to Loudness Rating or ORE, according to the selected Standard at **1 – Over-All Test**.For RMS Tests is added to the measured level.

The programming range is **-100 ÷ 100dB** with steps of 0.1dB.

12 – Delay

Setup of time between power supply/stimulus signal application and measure. The programming range is **0 ÷ 30s** with steps of 0.1s. The delay time is normally used for D.U.T. stabilization.

13 – Weighting

Allows selecting the filter to weight the measured signal.

Only available if at **1 – Over-All Test** item has been selected RMS Test.

Linear	No filter inserted.
A Filter	'A' filter inserted. The frequency response of this filter is the most related to human's frequency response for wide band noise.
Psophometric	Psophometric filter inserted. Normally used for acoustic noise measurements.

14 – OLR, RMS limits

Acceptance limits definition for Loudness Rating (OLR) or RMS measured, corresponding to the selected Test at **1 – Over-All Test**.

The programming range is **-100 ÷ 100dB** (**0 ÷ 100dBPa** or **dBV** for RMS Test), with steps of 0.1dB. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing.

15 – Frequency resp.

Calculus and evaluation of D.U.T. frequency response.

Floating	The D.U.T. frequency response is calculated and compared with a floating mask (see § 7.4). The mask floats vertically to contains all the frequency response. If that is not possible, an error message is displaied (see § 7.5).
Absolute	The D.U.T. frequency response is calculated and compared with a fixed mask (see § 7.4). If the measure is out of the mask limits, an error message is displaied.
Off	The D.U.T. frequency response is calculated but is not compared with any acceptance mask.

16 – Input selector

Selection of DIN connector which the AC3/AC4 Artificial Head, or other measurement system, is connected. The programming range is **Din 1 ÷ Din 4**, with the exclusion of the port already programmed as Output selector.

17 – Wait mode

Definition of generator state during delay time. Only available after setting a value more than 0s at **12 – Delay**.

Generator ON	Generator ON during delay. Tipically used for circuit stabilization.
Generator OFF	Generator OFF during delay.
4Hz Burst	Burst Test signal at 4Hz (125ms ON - 125ms OFF). Tipically used for hands free measurements, or generally, to avoid the automatic level regulation circuits intervention.

18 – Mask Change

Enabled only if Absolute or Floating has been selected at **14 - Frequency resp**.
See § 7.4.

7.3.5 TE Noise Test

Obtained the frequency response as series of N values X_f[dB], it is calculated the root main square value, using the algorithm shown in the following table.

RMS Value (Root Main Square)
$$RMS[dB] = 20LOG\sqrt{\sum_{f=1}^{N}\left\{10^{\frac{X_f+offset}{20}}\right\}^2}$$

In the algorithm above illustrated are not included eventual corrections for Ear Cavity (Artificial Head) and Signal Type (Speech).

Frequency response is obtained performing the sampling of the signal returned by the M repetitions (user programmable) applied to acquisitions frequency for frequency.

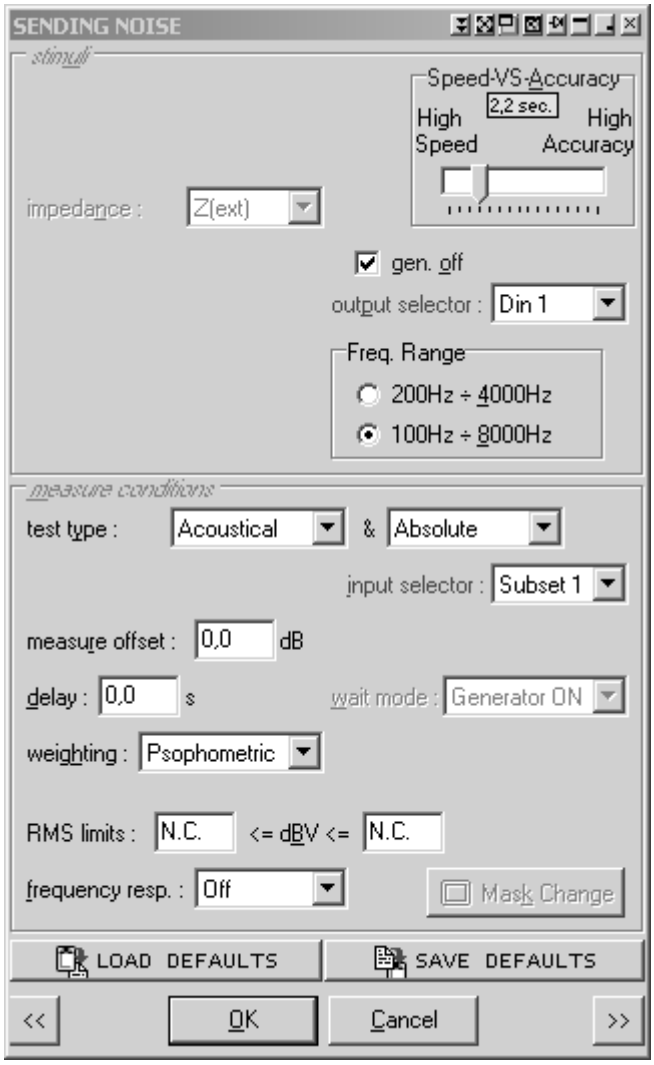
RMS Value (Frequency for Frequency)
$$RMS_f[dB] = 20LOG\sqrt{\frac{\sum_{r=1}^{M}\left\{10^{\frac{X_{rf}+offset}{20}}\right\}^2}{M}}$$

Background noise correction in Vrms (see § 12.6) is used in the following way:

RMS Value (Frequency for Frequency)
$$X_f[V_{rms}] = \sqrt{\left\{10^{\frac{X_f+offset}{20}}\right\}^2 - corr^2}$$

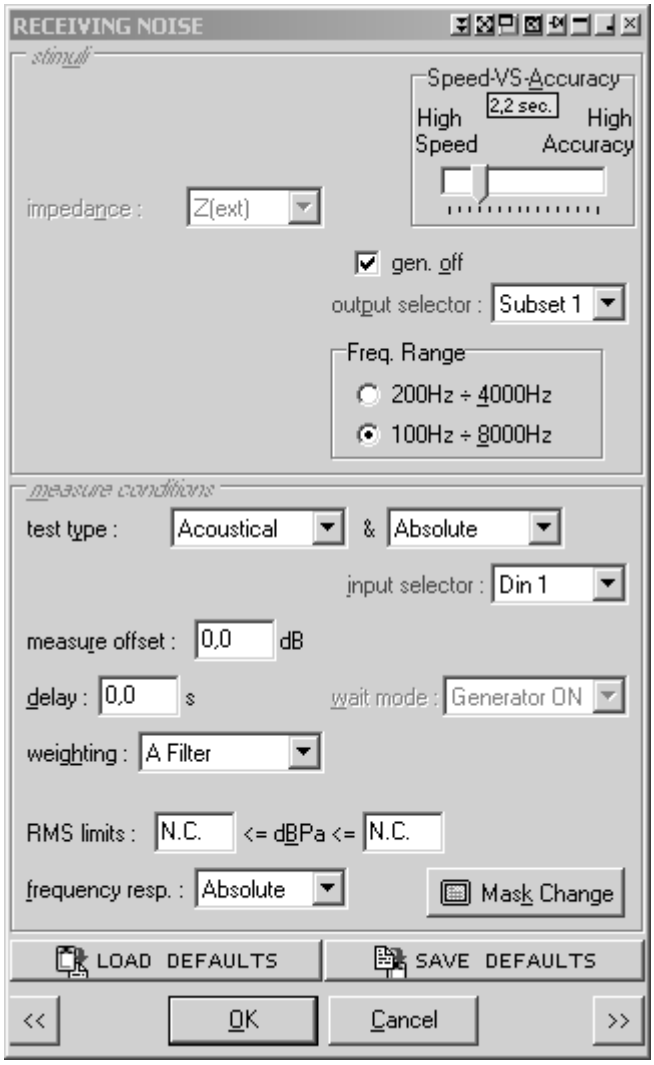
7.3.5.1 Sending TE Noise Test

Test parameters are similar to ones already described for the other tests.



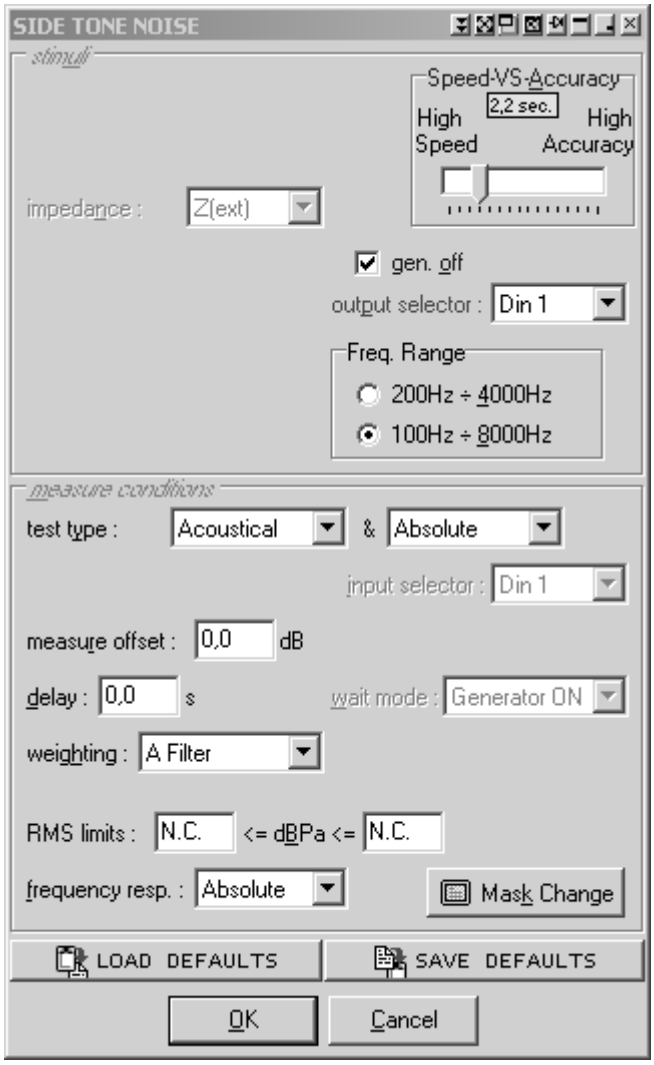
7.3.5.2 Receiving TE Noise Test

Test parameters are similar to ones already described for the other tests.



7.3.5.3 Side Tone TE Noise Test

Test parameters are similar to ones already described for the other tests.

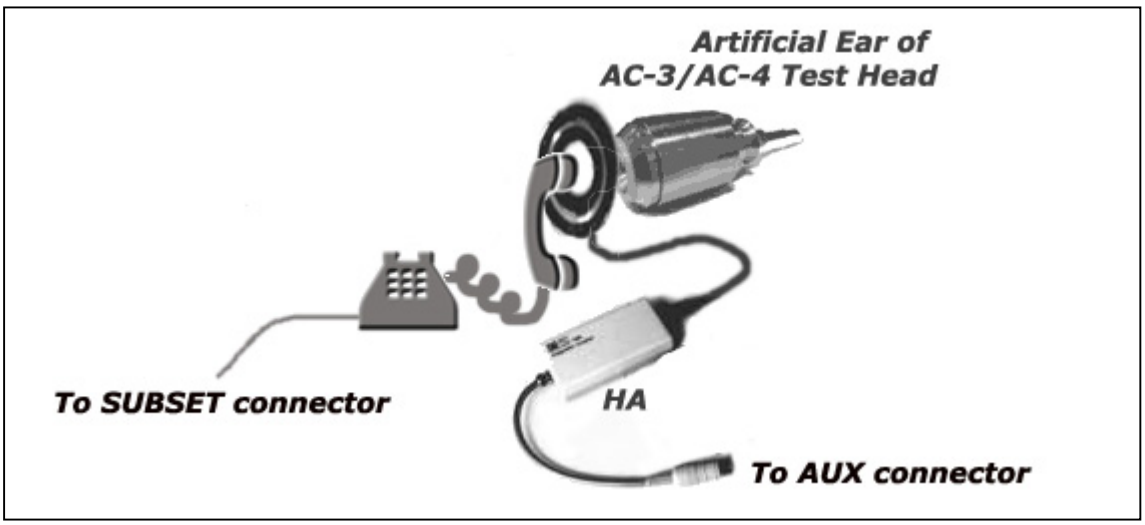


7.3.6 Hearing Aids Test

The measure of magnetic field generated by the receiving capsule allows to evaluate the eficiency of an eventual hearing-aids coupling.

The measure fully complies with Recommendation ITU-P370.

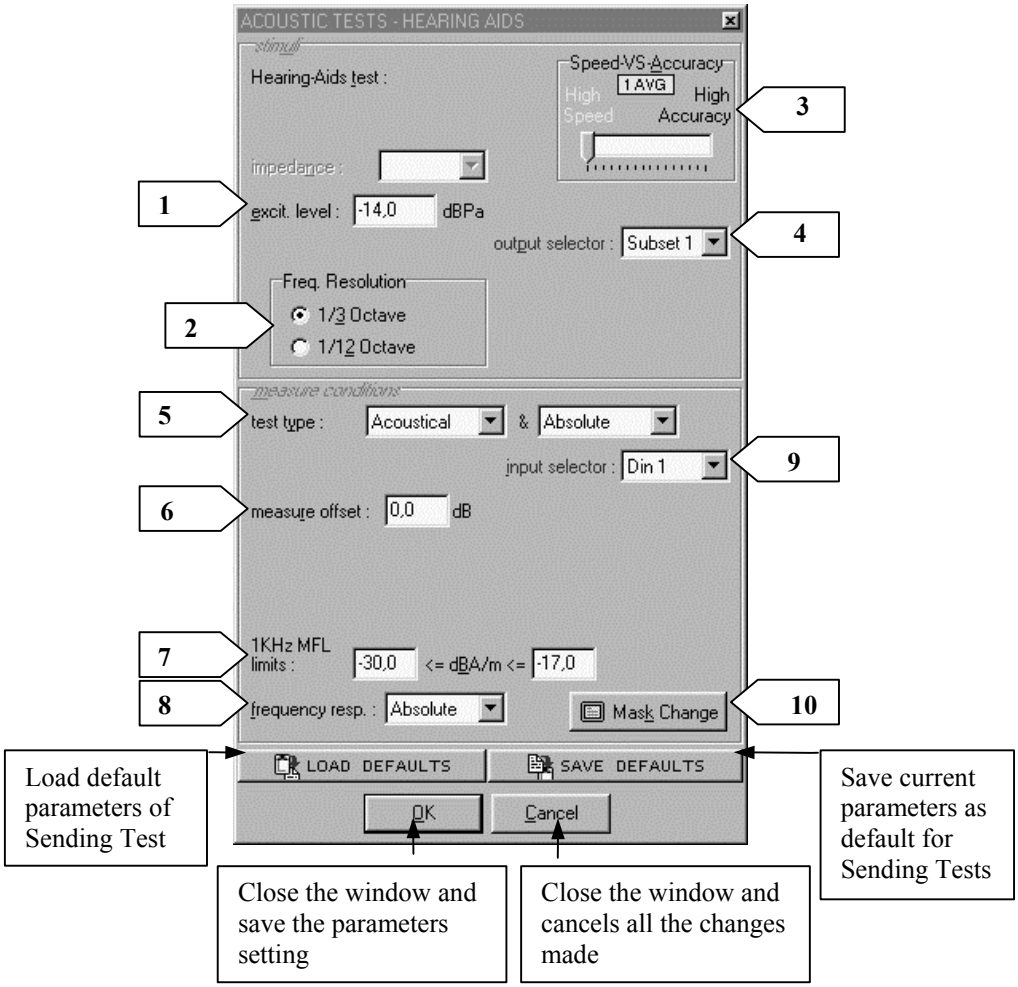
The Magnetic Field measure basic circuit is shown in the following figure:



The measuring process has two phases:

- A 1KHz signal is sent over the telephone line. The system automatically adjust the signal level to have, in the cavity of the Artificial Ear, the programmed acoustic pressure value.
- When the reference value has been reached, the Magnetic Field strength at 1KHz is measured. Using the same method for speech measurement, a composite signal is applied to the telephone line. The signal acquired, by F.F.T procedure, returns the strength of Magnetic Field for all the measurement spectrum.

Select **Hearing-aids** Test in the **Acoustic Tests** Menu. On the screen appears the following window:



1 – Excit. level

Setup of the reference acoustic pressure value in the artificial ear. A 1000Hz signal on the telephone line is regulated to obtain the programmed value.

Generated signal is supplied on pin 1 and 2 (cold wire) of the selected SUBSET connector at **4 – Output selector**.

-40.0 ÷ 11.0dBVemf (with step of 0.1dB)	If at **5 – Test type** has been selected Electrical.
-34,5 ÷ 13.8dBPa (with step of 0.1dB)	If at **5 – Test type** has been selected Acoustical.

2 – Freq. Resolution

Definition of measure resolution.

1/3 Octave	To build up the D.U.T. frequency response are measured 14 frequencies in according to ISO 3, R10 series.
1/12 Octave	To build up the D.U.T. frequency response are measured 53 frequencies in according to ISO 3, R40 series.

3 – Speed-Vs-Accuracy

Selection of the average number to execute on the acquired signal. Higher the specified number, higher the Test execution time and environmental noise immunity will be. Moreover, the pass-band will be narrower. The programming range is **1 ÷ 16 AVG**.

4 – Output selector

Selection of SUBSET connector which the D.U.T.is connected. The programming range is **Subset 1 ÷ Subset 4**.

5 – Test type

Programming of measure type.

Acoustical	Preset the System to perform measurement by Artificial Ear. Therefore, Microphone's corrective values, obtained from Electro-Acoustic Calibration (see § 12), are considered.
Electrical	System preset to perform measurement without consider any corrective values. Measure has the equivalence 1Pa=266mV.

&

Absolute	Preset the System to show all the results in absolute units (not related with previous results obtained from Tests of the same type).
Relative	Preset the System to show the results variation (increment/decrement), related to one previous Test of the same type. The measured value comes from the formula: $VAL_{REL} = (VAL_{ASS})_{ACT} - (VAL_{ASS})_{PRE}$ where: $(VAL_{ASS})_{ACT}$ Absolute value obtained from running Test. $(VAL_{ASS})_{PRE}$ Absolute value obtained from last absolute Test of the same type performed in the same Test Program.

6 – Measure offset

Setup of measure offset level. It is added to the measured spectrum and to MFL.
The programming range is **-100 ÷ 100dB** with steps of 0.1dB.

7 – 1 KHz MFL limits

Acceptance limits definition for the Magnetic Field strength measured at 1KHz, expressed in dB relative to 1 AmpereTurn/meter.

The programming range is **-100 ÷ 100dBA/m**, with steps of 0.1dB. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing.

8 – Frequency resp.

Calculus and evaluation of D.U.T. frequency response.

Floating	The D.U.T. frequency response is calculated and compared with a floating mask (see § 7.4). The mask floats vertically to contains all the frequency response. If that is not possible, an error message is displaied (see § 7.5).
Absolute	The D.U.T. frequency response is calculated and compared with a fixed mask (see § 7.4). If the measure is out of the mask limits, an error message is displaied.
Off	The D.U.T. frequency response is calculated but is not compared with any acceptance mask.

9 – Input selector

Selection of DIN connector which the AC3/AC4 Artificial Head, or other measurement system, is connected. The programming range is **Din 1 ÷ Din 4**.

10 – Mask Change

Enabled only if Absolute or Floating has been selected at **8 - Frequency resp**.
See § 7.4.

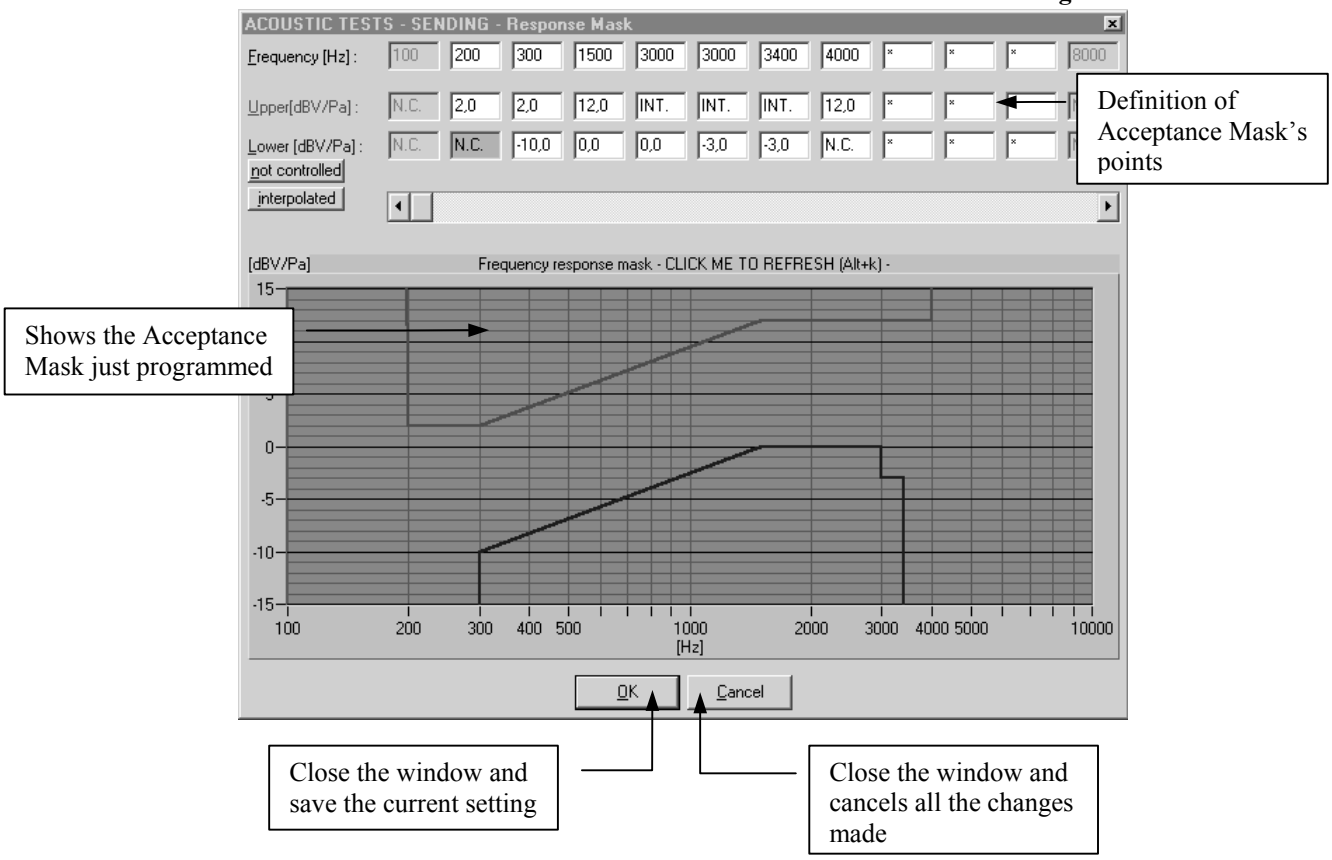
7.4 Acceptance Mask setting

Pressing **Mask Change** button**,** on the Test parameter setting window, is possible to set an acceptance mask for every single Test type (Sending, Receiving, Side Tone, Over-All).

For each frequency where the lower or upper limit slope changes, the corresponding dB value must be instroduced.

The acceptance mask is programmed by defining the points in which the slope changes; those are the extremes of the segments that make up the mask. They can be displayed on a level[dB]/frequency[Hz – logarithmic scale] diagram.

fig.7.2.3


ACOUSTIC TESTS - SENDING - Response Mask
Frequency [Hz] :
Upper[dBV/Pa] :
Lower [dBV/Pa] :
not controlled
interpolated
Definition of Acceptance Mask's points
[dBV/Pa]
Frequency response mask - CLICK ME TO REFRESH (Alt+k) -
Shows the Acceptance Mask just programmed
[Hz]
OK
Cancel
Close the window and save the current setting
Close the window and cancels all the changes made

To program a "step", it's necessary to insert two times consecutively the same frequency with the two different levels.

If, for certain frequencies, a limit is not on a slope but is a middle point of one segment, it can be declared as "interpolated". To do that, press **interpolated** button, that appears when a box for limits typiing is selected. **INT** label will replace the numeric value.

If, for certain frequencies, is not needed to control the upper or the lower limit, press **not controlled** button that appears when a box for limits typiing is selected. **N.C.** label will replace the numeric value.

Frequencies must be introduced in progressive order and the maximum number of programmable points is 20, with 1Hz as minimum step between one and another.

It's not possible to define more than 3 times the same frequency.

Min and Max programmable frequencies are respectively 100 and 8000Hz, and the acceptance limits are from –100 to 100dB.

Selecting a frequency and pressing **last step** button, will be erased all the programmed limits starting from the selected frequency.

7.5 Viewing results

Results obtained from D.U.T. are displayed on **Results Table** window (see § 4.1).
An example is shown below:

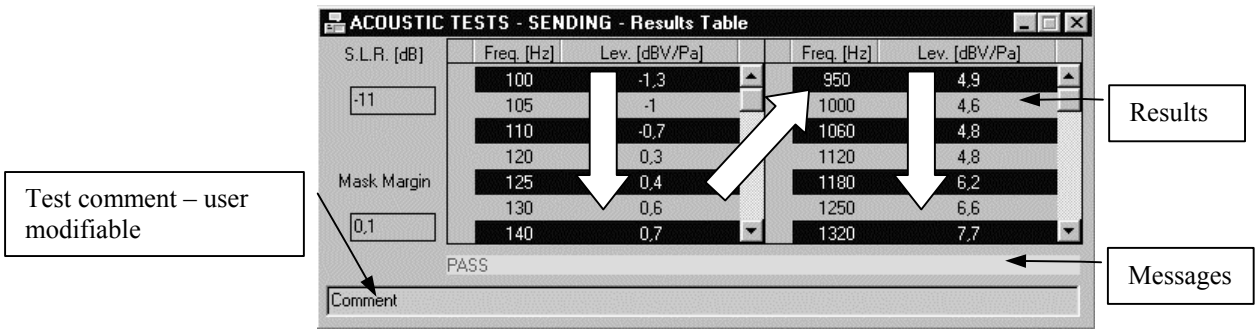


fig.7.2.4

To scroll all the Test's results use the vertical scrolling bars on the right of the results column. Ascending order in which they are shown is illustrated by arrow's direction on fig.7.2.4.

Are shown on the left of the window, Mask Margin, Loudness Rating, RMS or Reference Equivalent value (depends on the type of running Test) with its measuring unit.

CS8030 System also shown, by symbols near measure values, the error type:

Value under low acceptance limit

Value over high acceptance limit

and for Mask Margin:

If, at least, one value is out of acceptance limits (low or high) and if **Floating** has been selected at **Frequency resp.** in the Test settings.

If, at least, one value is out of acceptance limit (low) and if **Absolute** has been selected at **Frequency resp.** in the Test settings. If more values are out of limits (low or high), arrow shows that greater error has been found for values out of low limit.

If, at least, one value is out of acceptance limit (high) and if **Absolute** has been selected at **Frequency resp.** in the Test settings. If more values are out of limits (low or high), arrow shows that greater error has been found for values out of high limit.

The **Results Table** it's also used for electro-acoustic Calibration Procedure (see § 12) to display advice or error messages and calibration results.

At the end of the running Test, the System displays following messages:

PASS Positive Test's final result (All values inside acceptance limits).
FAIL Negative Test's final result (one value at least is outside acceptance limits).

Chapter 8

DISTORTION TESTS

8.1 Distortion measures

8.1.1 Principles of measure

A transducer output signal is not, in general, an exact copy of the input waveform by reason of various types of distortion.

The Harmonic Distortion (HD) is a form of distortion in analog circuits that adds harmonics (signals whose frequencies are integer multiples of the input signal frequency - fundamental), to the output signal.

Distortion measurement allows evaluating the transducer linearity.

The System calculates Harmonic Distortion, in percentage, like:

$$HD\,[\%] = \frac{\sqrt{A_2{}^2 + A_3{}^2 + \ldots}}{A_1} \times 100$$

Where:
A1...n = RMS of 1...n order harmonics.
A1 = Fundamental RMS value.

The Total Distortion (TD), in percentage, is calculated as the ratio of output signal RMS (without fundamental frequency) to the RMS of the original signal (only fundamental frequency).

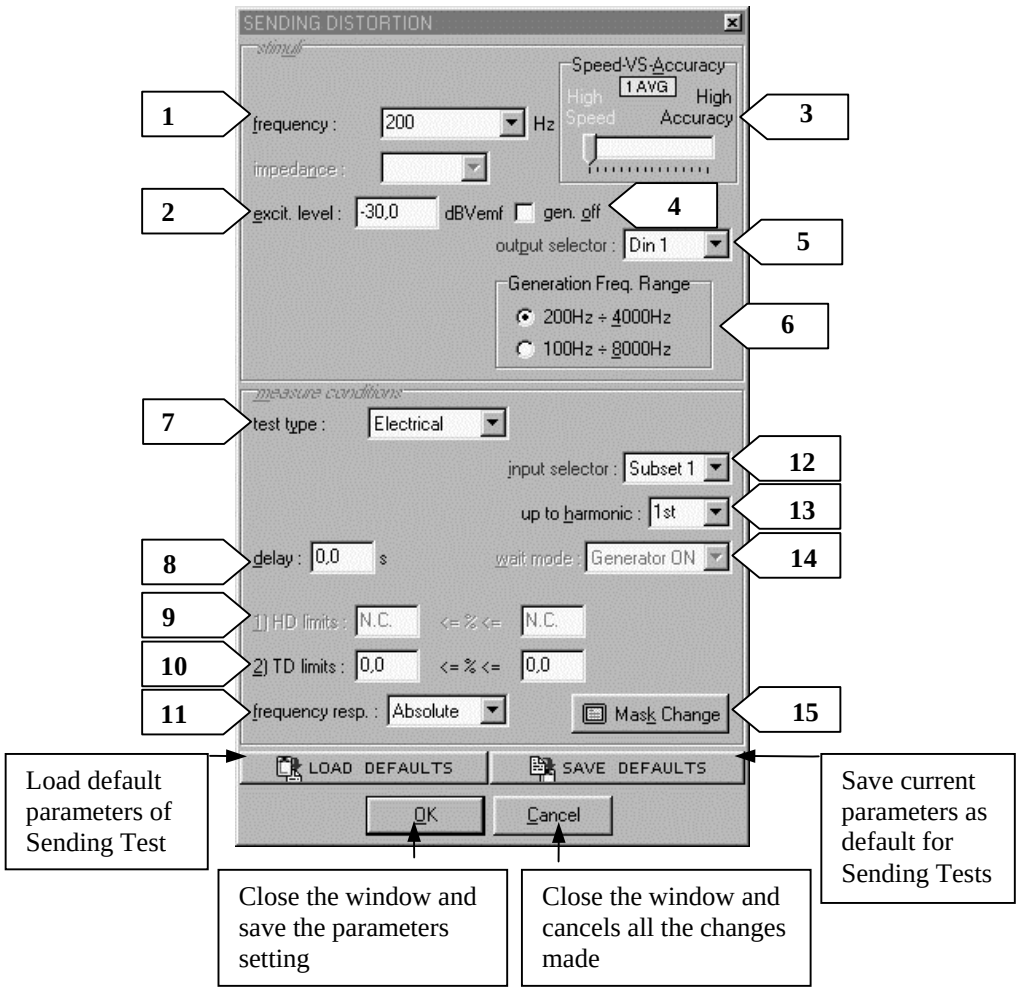
8.2 Insertion of “Distortion” Test

To insert a “Distortion” Test in the active Test Program, select **Tests** Menu in the**Main Menu**.
Then select **Distortion Tests**. Will be shown a list of the available Tests.

To set the parameters for each kind of “Distortion” Test, please refer to the specific paragraph.

8.2.1 Sending Test

Select **Sending** Test in the **Distortion Tests** Menu. On the screen the following window appears:



1 – Frequency

Programming of Test stimulus frequency (Fundamental frequency).
Limits depend on the selection at **6 – Generation Freq. Range**.

2 – Excit. level

Setup of Test stimulus level.

-40.0 ÷ 11.0dBVemf (with step of 0.1dB)	If at **7 – Test type** has been selected Electrical
-34.5 ÷ 13.8dBPa (with step of 0.1dB)	If at **7 – Test type** has been selected Acoustical

3 – Speed-Vs-Accuracy

Selection of the average number to execute on the acquired signal. Higher the specified number, higher the Test execution time and environmental noise immunity will be. Moreover, the pass-band will be narrower. The programming range is **1 ÷ 16 AVG**.

4 – Generator off

Setup the generator during Test execution. If selected, the System does not generate any signal by DIN connector selected at **5 – Output selector**. Then, the programmed level at **2 – Excit. level**, will be only a reference value.

5 – Output selector

Selection of DIN connector which the AC3/AC4 Artificial Head is connected. The programming range is **Din 1 ÷ Din 4**.

6 – Generation Freq. Range

Frequency range definition for stimuli generation. It's possible to select the restricted band **200 ÷ 4000Hz** or extended band **100 ÷ 8000Hz**.

7 – Test type

Programming of measure type.

Acoustical	Preset the System to produce stimulus by Artificial Mouth. Therefore, Mouth's corrective values, obtained from Electro-Acoustic Calibration (see § 12), are considered.
Electrical	System preset to perform measurement without consider any corrective values. Measure has the equivalence 266mV=1Pa.

8 – Delay

Setup of time between power supply/stimulus signal application and measure. The programming range is **0 ÷ 30s** with steps of 0.1s. The delay time is normally used for D.U.T. stabilization.

9 – HD limits

The programming range is **0 ÷ 100**% with steps of 0.1%. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing. Available if at **13 – Up to harmonic** has been selected an harmonic greater than the first.

10 – TD limits

Acceptance limits for Total Distortion.
The programming range is **0 ÷ 100**% with steps of 0.1%. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing.

11 – Frequency resp.

Programming the check of D.U.T. frequency spectrum.

Absolute	The D.U.T. frequency spectrum is calculated and compared with a fixed mask (see § 7.4). If the measure is out of the mask limits, an error message is displaied.
Off	The D.U.T. frequency spectrum is calculated but is not compared with any acceptance mask.

12 – Input selector

Selection of the SUBSET connector to which the D.U.T. is connected. The programming range is **Subset 1 ÷ Subset 4**.

13 – Up to harmonic

Selection of harmonic limit to which performs the measure. Are available only the harmonics not beyond the maximum limit of the System, that for this specific Test type is always 8000Hz.

14 – Wait mode

Definition of generator state during delay time. Only available after setting a value more than 0s at **8 – Delay**.

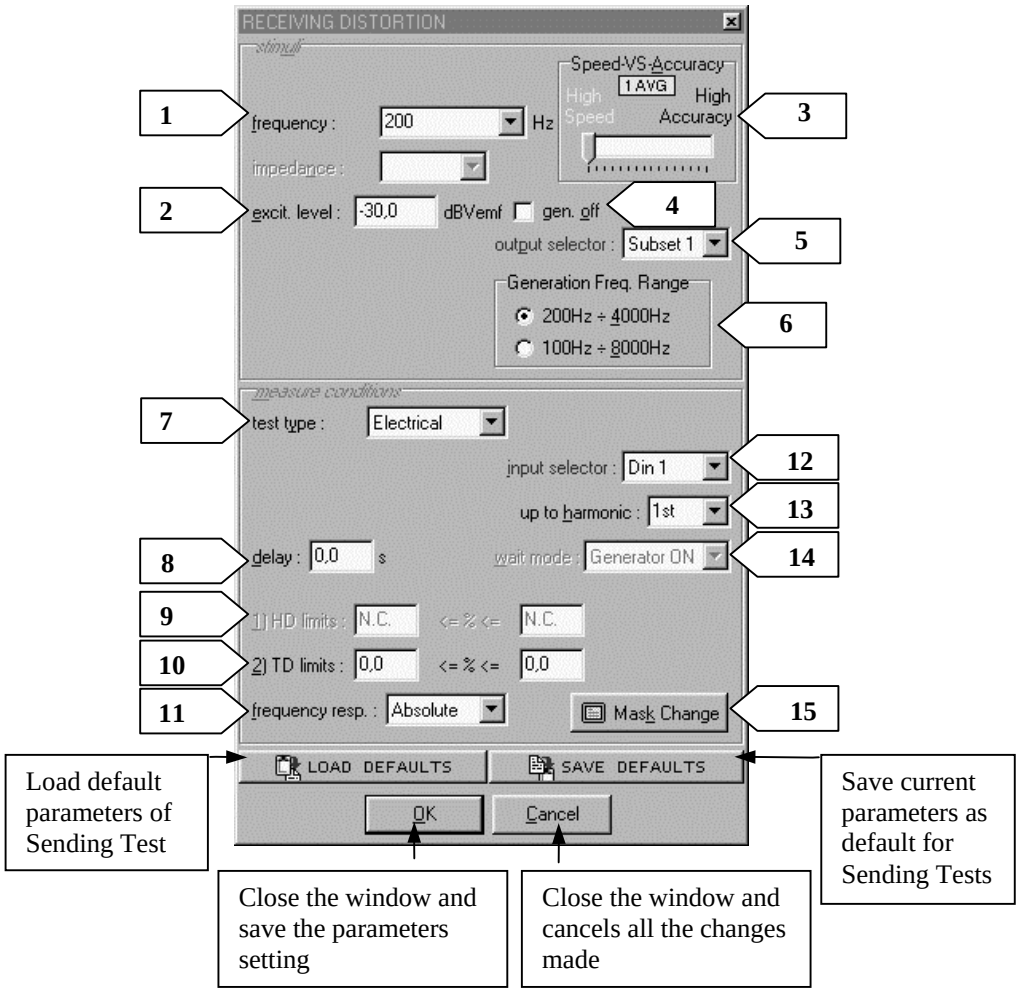
Generator ON	Generator ON during delay. Tipically used for circuit stabilization.
Generator OFF	Generator OFF during delay.
4Hz Burst	Burst Test signal at 4Hz (125ms ON - 125ms OFF). Tipically used for hands free measurements, or generally, to avoid the automatic level regulation circuits intervention.

15 – Mask Change

Enabled only if Absolute has been selected at **11 - Frequency resp**.
See § 7.4.

8.2.2 Receiving Test

Select **Receiving** Test in the **Distortion Tests** Menu. On the screen the following window appears:



1 – Frequency

Programming of Test stimulus frequency (Fundamental frequency).
Limits depend on the selection at **6 – Generation Freq. Range**.

2 – Excit. level

Setup of Test stimulus level.

-40.0 ÷ 11.0dBVemf (with step of 0.1dB)	If at **7 – Test type** has been selected Electrical
-34.5 ÷ 13.8dBPa (with step of 0.1dB)	If at **7 – Test type** has been selected Acoustical

3 – Speed-Vs-Accuracy

Selection of the average number to execute on the acquired signal. Higher the specified number, higher the Test execution time and environmental noise immunity will be. Moreover, the pass-band will be narrower. The programming range is **1 ÷ 16 AVG**.

4 – Generator off

Setup the generator during Test execution. If selected, the System does not generate any signal by SUBSET connector selected at **5 – Output selector**. Then, the programmed level at **2 – Excit. level**, will be only a reference value.

5 – Output selector

Selection of SUBSET connector which the D.U.T.is connected. The programming range is **Subset 1 ÷ Subset 4**.

6 – Generation Freq. Range

Frequency range definition for stimuli generation. It's possible to select the restricted band **200 ÷ 4000Hz** or extended band **100 ÷ 8000Hz**.

7 – Test type

Programming of measure type.

Acoustical	Preset the System to perform measurement by Artificial Ear. Therefore, Microphone's corrective values, obtained from Electro-Acoustic Calibration (see § 12), are considered.
Electrical	System preset to perform measurement without consider any corrective values. Measure has the equivalence 1Pa=266mV.

8 – Delay

Setup of time between power supply/stimulus signal application and measure. The programming range is **0 ÷ 30s** with steps of 0.1s. The delay time is normally used for D.U.T. stabilization.

9 – HD limits

The programming range is **0 ÷ 100**% with steps of 0.1%. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing. Available if at **13 – Up to harmonic** has been selected an harmonic greater than the first.

10 – TD limits

Acceptance limits for Total Distortion.

The programming range is **0 ÷ 100**% with steps of 0.1%. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing.

11 – Frequency resp.

Programming the check of D.U.T. frequency spectrum.

Absolute	The D.U.T. frequency spectrum is calculated and compared with a fixed mask (see § 7.4). If the measure is out of the mask limits, an error message is displaied.
Off	The D.U.T. frequency spectrum is calculated but is not compared with any acceptance mask.

12 – Input selector

Selection of the DIN connector to which the AC3/AC4 Artificial Head, or other measurement system, is connected. The programming range is **Din 1 ÷ Din 4**.

13 – Up to harmonic

Selection of harmonic limit to which performs the measure. Are available only the harmonics not beyond the maximum limit of the System, that is:

- 8000Hz if at **7 – Test type** has been selected:
  - Acoustical and it is used an AC/4 Artificial Head.
  - Electrical
- 4000Hz In other cases.

14 – Wait mode

Definition of generator state during delay time. Only available after setting a value more than 0s at **8 – Delay**.

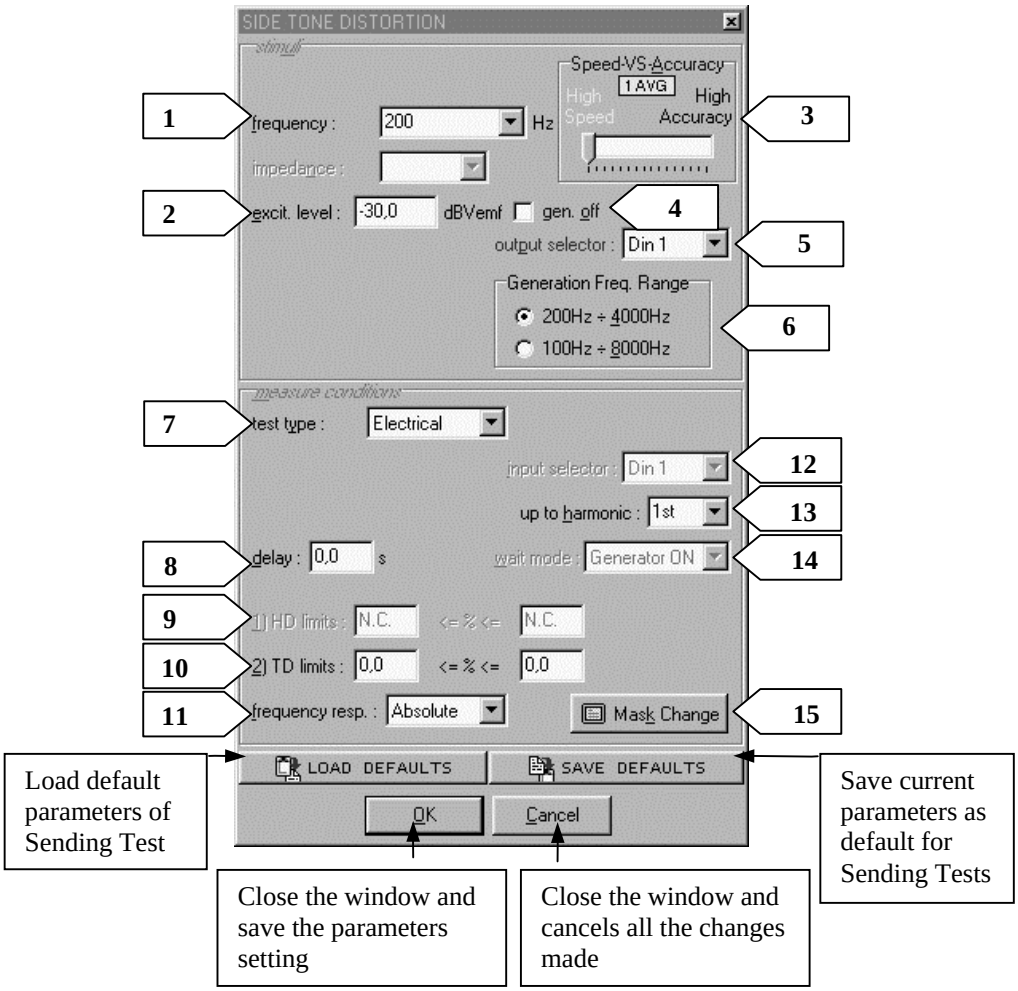
Generator ON	Generator ON during delay. Tipically used for circuit stabilization.
Generator OFF	Generator OFF during delay.
4Hz Burst	Burst Test signal at 4Hz (125ms ON - 125ms OFF). Tipically used for hands free measurements, or generally, to avoid the automatic level regulation circuits intervention.

15 – Mask Change

Enabled only if Absolute has been selected at **11 - Frequency resp**.
See § 7.4.

8.2.3 Side Tone Test

Select **Side Tone** Test in the **Distortion Tests** Menu. On the screen appears the following window:



1 – Frequency

Programming of Test stimulus frequency (Fundamental frequency).
Limits depend on the selection at **6 – Generation Freq. Range**.

2 – Excit. level

Setup of Test stimulus level.

-40.0 ÷ 11.0dBVemf (with step of 0.1dB)	If at **7 – Test type** has been selected Electrical
-34.5 ÷ 13.8dBPa (with step of 0.1dB)	If at **7 – Test type** has been selected Acoustical

3 – Speed-Vs-Accuracy

Selection of the average number to execute on the acquired signal. Higher the specified number, higher the Test execution time and environmental noise immunity will be. Moreover, the pass-band will be narrower. The programming range is **1 ÷ 16 AVG**.

4 – Generator off

Setup the generator during Test execution. If selected, the System does not generate any signal by DIN connector selected at **5 – Output selector**. Then, the programmed level at **2 – Excit. level**, will be only a reference value.

5 – Output selector

Selection of DIN connector which the D.U.T. is connected. The programming range is **Din 1 ÷ Din 4**.

6 – Generation Freq. Range

Frequency range definition for stimuli generation. It's possible to select the restricted band **200 ÷ 4000Hz** or extended band **100 ÷ 8000Hz**.

7 – Test type

Programming of measure type.

Acoustical	Preset the System to perform measurement by Artificial Ear and produce stimulus by Artificial Mouth. Therefore, Microphone and Mouth's corrective values, obtained from Electro-Acoustic Calibration (see § 12), are considered.
Electrical	System preset to perform measurement without consider any corrective values. Measure has the equivalence 1Pa=266mV.

8 – Delay

Setup of time between power supply/stimulus signal application and measure. The programming range is **0 ÷ 30s** with steps of 0.1s. The delay time is normally used for D.U.T. stabilization.

9 – HD limits

The programming range is **0 ÷ 100**% with steps of 0.1%. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing. Available if at **13 – Up to harmonic** has been selected an harmonic greater than the first.

10 – TD limits

Acceptance limits for Total Distortion.

The programming range is **0 ÷ 100**% with steps of 0.1%. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing.

11 – Frequency resp.

Programming the check of D.U.T. frequency spectrum.

Absolute	The D.U.T. frequency spectrum is calculated and compared with a fixed mask (see § 7.4). If the measure is out of the mask limits, an error message is displaied.
Off	The D.U.T. frequency spectrum is calculated but is not compared with any acceptance mask.

12 – Input selector

Selection of the DIN connector to which the AC3/AC4 Artificial Head, or other measurement system, is connected. It's the same port programmed at **5 – Output selector**.

13 – Up to harmonic

Selection of harmonic limit to which performs the measure.
Are available only the harmonics not beyond the maximum limit of the System, that is:

- 8000Hz if at **7 – Test type** has been selected:
  - Acoustical and it is used an AC/4 Artificial Head.
  - Electrical
- 4000Hz In other cases.

14 – Wait mode

Definition of generator state during delay time. Only available after setting a value more than 0s at **8 – Delay**.

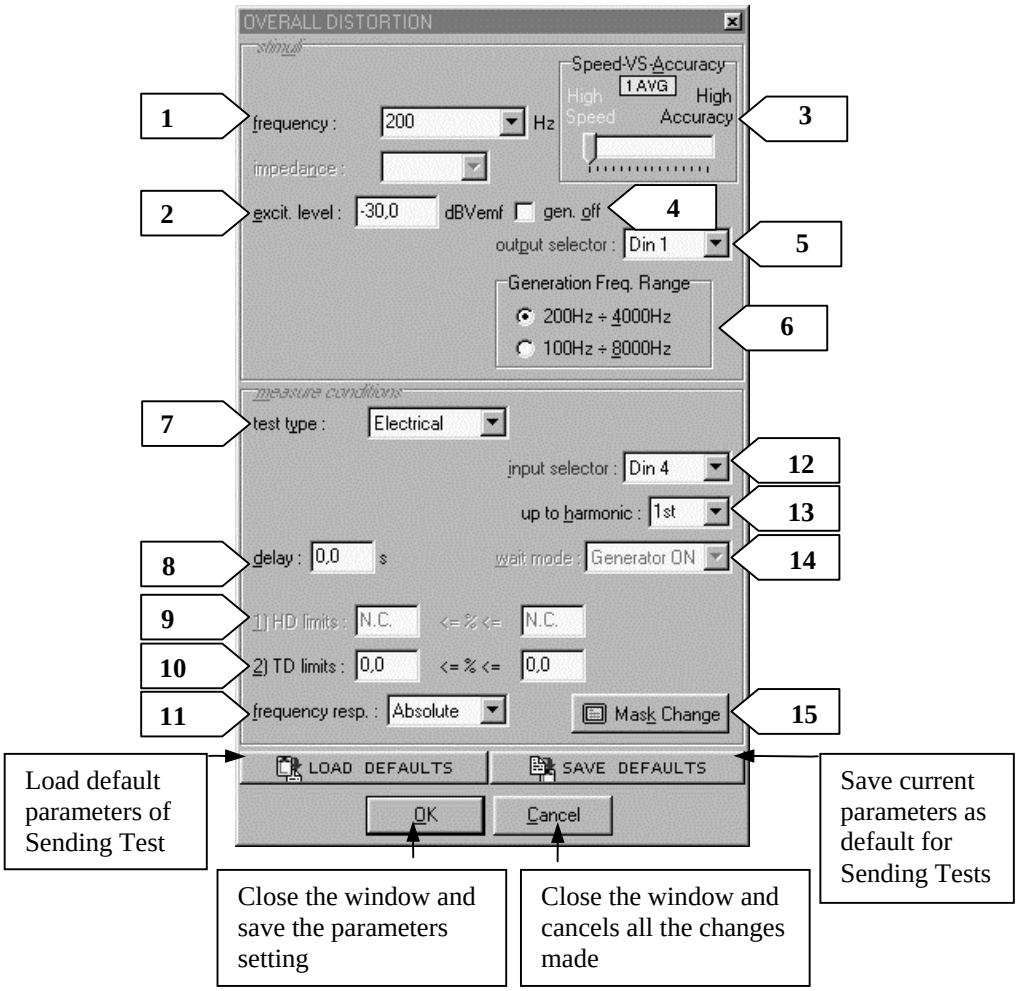
Generator ON	Generator ON during delay. Tipically used for circuit stabilization.
Generator OFF	Generator OFF during delay.
4Hz Burst	Burst Test signal at 4Hz (125ms ON - 125ms OFF). Tipically used for hands free measurements, or generally, to avoid the automatic level regulation circuits intervention.

15 – Mask Change

Enabled only if Absolute has been selected at **11 - Frequency resp**.
See § 7.4.

8.2.4 Over-All Test

Select **Over-All** Test in the **Distortion Tests** Menu. On the screen appears the following window:



1 – Frequency

Programming of Test stimulus frequency (Fundamental frequency).
Limits depend on the selection at **6 – Generation Freq. Range**.

2 – Excit. level

Setup of Test stimulus level.

-40.0 ÷ 11.0dBVemf (with step of 0.1dB)	If at **7 – Test type** has been selected Electrical
-34.5 ÷ 13.8dBPa (with step of 0.1dB)	If at **7 – Test type** has been selected Acoustical

3 – Speed-Vs-Accuracy

Selection of the average number to execute on the acquired signal. Higher the specified number, higher the Test execution time and environmental noise immunity will be. Moreover, the pass-band will be narrower. The programming range is **1 ÷ 16 AVG**.

4 – Generator off

Setup the generator during Test execution. If selected, the System does not generate any signal by DIN connector selected at **5 – Output selector**. Then, the programmed level at **2 – Excit. level**, will be only a reference value.

5 – Output selector

Selection of DIN connector which the signal generator (AC3/AC4 Artrificial Head or other equipment). is connected. The programming range is **Din 1 ÷ Din 4**.

6 – Generation Freq. Range

Frequency range definition for stimuli generation. It's possible to select the restricted band **200 ÷ 4000Hz** or extended band **100 ÷ 8000Hz**.

7 – Test type

Programming of measure type.

Acoustical	Preset the System to perform measurement by Artificial Ear and produce stimulus by Artificial Mouth. Therefore, Microphone and Mouth's corrective values, obtained from Electro-Acoustic Calibration (see § 12), are considered.
Electrical	System preset to perform measurement without consider any corrective values. Measure has the equivalence 1Pa=266mV.

8 – Delay

Setup of time between power supply/stimulus signal application and measure. The programming range is **0 ÷ 30s** with steps of 0.1s. The delay time is normally used for D.U.T. stabilization.

9 – HD limits

Acceptance limits for Harmonic Distortion.
The programming range is **0 ÷ 100**% with steps of 0.1%. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing. Available if at **13 – Up to harmonic** has been selected an harmonic greater than the first.

10 – TD limits

Acceptance limits for Total Distortion.
The programming range is **0 ÷ 100**% with steps of 0.1%. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing.

11 – Frequency resp.

Programming the check of D.U.T. frequency spectrum.

Absolute	The D.U.T. frequency spectrum is calculated and compared with a fixed mask (see § 7.4). If the measure is out of the mask limits, an error message is displaied.
Off	The D.U.T. frequency spectrum is calculated but is not compared with any acceptance mask.

12 – Input selector

Selection of DIN connector which the AC3/AC4 Artificial Head, or other measurement system, is connected. The programming range is **Din 1 ÷ Din 4**.

13 – Up to harmonic

Selection of harmonic limit to which performs the measure.
Are available only the harmonics not beyond the maximum limit of the System, that is:

- 8000Hz if at **7 – Test type** has been selected:
  - Acoustical and are used two AC/4 Artificial Head.
  - Acoustical and it is used an AC/4 Artificial Head connected to the DIN selected at **12 – Input selector**.
  - Electrical
- 4000Hz In other cases.

14 – Wait mode

Definition of generator state during delay time. Only available after setting a value more than 0s at **8 – Delay**.

Generator ON	Generator ON during delay. Tipically used for circuit stabilization.
Generator OFF	Generator OFF during delay.
4Hz Burst	Burst Test signal at 4Hz (125ms ON - 125ms OFF). Tipically used for hands free measurements, or generally, to avoid the automatic level regulation circuits intervention.

15 – Mask Change

Enabled only if Absolute has been selected at **11 - Frequency resp**.
See § 7.4.

Chapter 9

ELECTRICAL TESTS

9.1 Return-loss measures

9.1.1 Principles of measure

Return-loss measurements give the trend of D.U.T.'s impedance for all frequencies of the spectrum.

The test is made in normal condition of use with line closed with the reference impedance (Zout).

The circuit of fig.9.1 is arranged; by that it's possible to measure the mismatch impedance of User System (Zx).

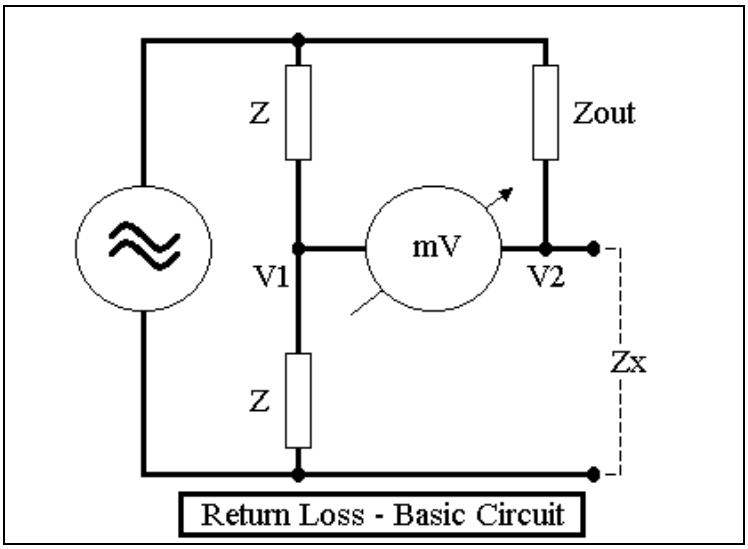


fig.9.1

The circuit above allows to evaluate the mismatch impedance by measuring *V2-V1* (in rapport to the generator output) and using this formula:

$$a(dB) = 20 * \log\left|\frac{(Z+R)}{(Z-R)}\right|$$

where **Z** is the User System impedance (**Zx**) defined in the vector field, and **R** is the reference impedance (**Zout**).

By **F.F.T.** we have the magnitude of the vectors at the various fundamental frequencies and relating harmonics. These values rapported to the stimulus voltage give the impedance mismatch **Xf** for each frequency.

ERL[1] represents the reflected energy from user to source and it's defined as the integral of the mismatches impedance in the range from 300 to 3400Hz. Using discrete form and in the range of CS8030, we have:

ECHO RETURN LOSS

$$ERL(dB) = 3.10 - 10 * \log \sum_{f=1}^{N} \left[X_f * \log \left(\frac{f_f}{f_{f-1}} \right) \right] + offset$$

where $\mathbf{X_f}$ and $\mathbf{f_f}$ are respectively the discrete spectrum computed and the relative frequency.

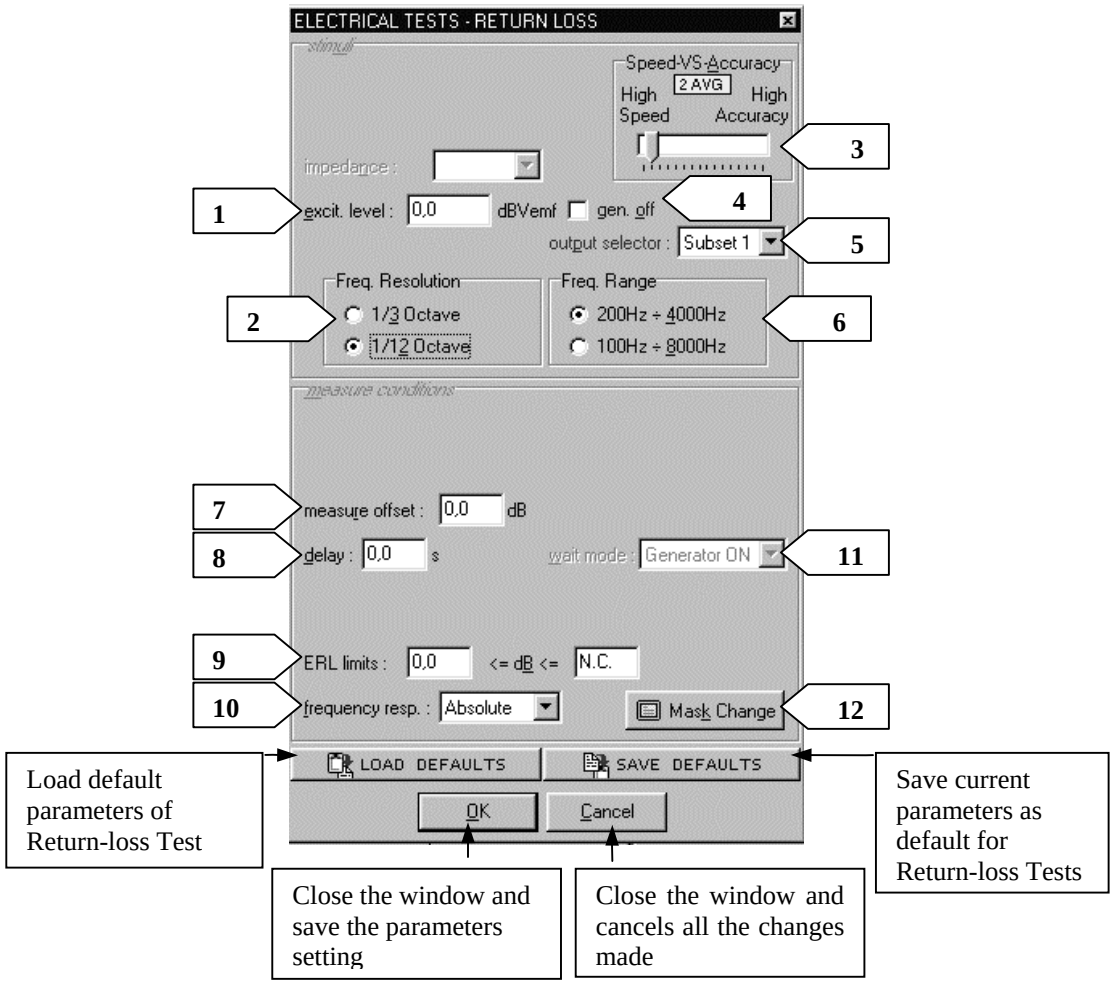
[1] ERL=**E**cho **R**eturn **L**oss

9.2 Insertion of "Return Loss" Test

To insert a "Return Loss" Test in the active Test Program, select **Tests** Menu in the **Main Menu**.

Then select **Electrical Tests**. Will be shown a list of the available Tests.

Select **Return-loss** Test in the **Electrical Tests** Menu. On the screen the following window appears:



1 – Excit. level

Setup of Test stimulus level.

The output impedance must be connected to Z_{out} terminals on the rear panel (see § 3.3.2).

Generated signal is supplied on pin 1 and 2 (cold wire) of the selected SUBSET connector with Z_{out}=0.

-40.0 ÷ 11.0dBVemf (with step of 0.1dB)	Programming range.

2 – Freq. Resolution

Definition of measure resolution.

1/3 Octave	To build up the D.U.T. frequency response are measured 20 frequencies (If at **8 -Freq. Range** has been selected 100Hz ÷ 8000Hz) or 14 frequencies (If at **8 -Freq. Range** has been selected 200Hz ÷ 4000Hz) in according to ISO 3, R10 series.
1/12 Octave	To build up the D.U.T. frequency response are measured 77 frequencies (If at **8 – Freq. Range** has been selected the 100Hz ÷ 8000Hz) or 53 frequencies (If at **8 – Freq. Range** has been selected 200Hz ÷ 4000Hz) in according to ISO 3, R40 series.

3 – Speed-Vs-Accuracy

Selection of the average number to execute on the acquired signal. Higher the specified number, higher the Test execution time and environmental noise immunity will be. Moreover, the pass-band will be narrower. The programming range is **1 ÷ 16 AVG**.

4 – Generator off

Setup the generator during Test execution. If selected, is not supplied any signal from SUBSET connector selected at **5 – Output selector**.

5 – Output selector

Selection of SUBSET connector which the D.U.T.is connected. The programming range is **Subset 1 ÷ Subset 2**.

6 – Freq. Range

Frequency range definition for stimuli generation. It's possible to select the restricted band **200 ÷ 4000Hz** or extended band **100 ÷ 8000Hz**.

7 – Measure offset

Setup of measure offset level. It is added to the measured spectrum and to Loudness Rating.The programming range is **-100 ÷ 100dB** with steps of 0.1dB.

8 – Delay

Setup of time between power supply/stimulus signal application and measure. The programming range is **0 ÷ 30s** with steps of 0.1s. The delay time is normally used for D.U.T. stabilization.

9 – ELR limits

Acceptance limits definition for measured Loudness Rating (ELR).

The programming range is **-100 ÷ 100dB**, with steps of 0.1dB. It's possible to not control one or both limits selecting the **not controlled** button that appears after activating one box used for values typing.

10 – Frequency resp.

Calculus and evaluation of D.U.T. frequency response.

Floating	The D.U.T. frequency response is calculated and compared with a floating mask (see § 7.4). The mask floats vertically to contains all the frequency response. If that is not possible, an error message is displaied (see § 7.5).
Absolute	The D.U.T. frequency response is calculated and compared with a fixed mask (see § 7.4). If the measure is out of the mask limits, an error message is displaied.
Off	The D.U.T. frequency response is calculated but is not compared with any acceptance mask.

11 – Wait mode

Definition of generator state during delay time. Only available after setting a value more than 0s at **8 – Delay**.

Generator ON	Generator ON during delay. Tipically used for circuit stabilization.
Generator OFF	Generator OFF during delay.
4Hz Burst	Burst Test signal at 4Hz (125ms ON - 125ms OFF). Tipically used to avoid the automatic level regulation circuits intervention.

12 – Mask Change

Not available if at **10 - Frequency resp.** has been selected off.
See § 7.4.

Chapter 10

COLLECTION/RECORDING & PRINT

10.1 Generals

In this chapter are described data collection and print functions of CS8030 System.

Each window shown in this chapter may be different from those displayed by the System during operations.

10.2 Collection and Recording

A Collection saves parameters and results in an orderly way; they are acquired from different Samples and Tests during execution of the same Test Program.

Using Collections it is possible to get statistic data, create and print Test report with additional information like DUT model and manufacturer.

A Collection saves, for every Test performed, all the results and its specific parameters. It saves also, general information about the Test Program only once at Collection opening, reducing the file size (Kilobyte) in relation to the Recording file.

This file, with ".COL" extension, could be renamed and saved in user-created folders.

A Recording saves data that are acquired in different working sessions and from different Samples. It is possible also to save parameters and results acquired from Tests included in different Test Programs.

Moreover, a Recording saves, for every Test performed, all the results and its specific parameters.

This file, with ".REC" extension, could be renamed and saved in user-created folders.

Following are described all the commands in the **Collection/Recording** Menu (see § 4.9).

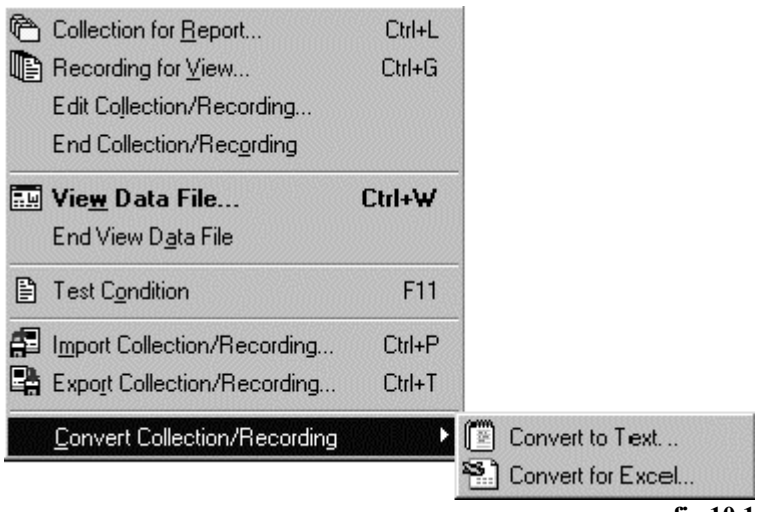


fig.10.1

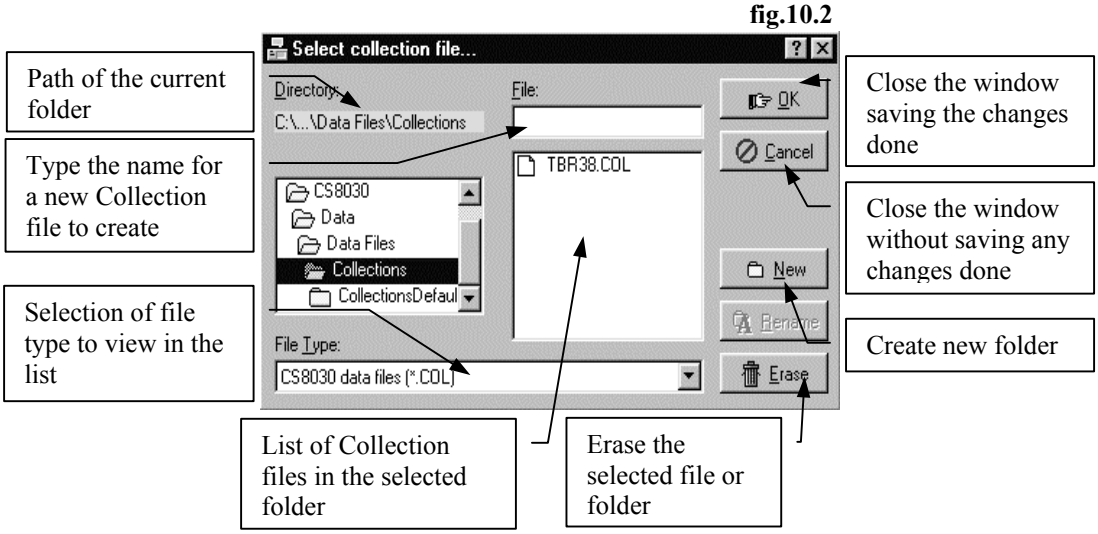
10.2.1 Collection for Report

The **Collection for Report** command opens a new Collection or allows opening an existing one.

This command is available only after a Test Program is opened or saved.

The first window that appears is the following:

fig.10.2



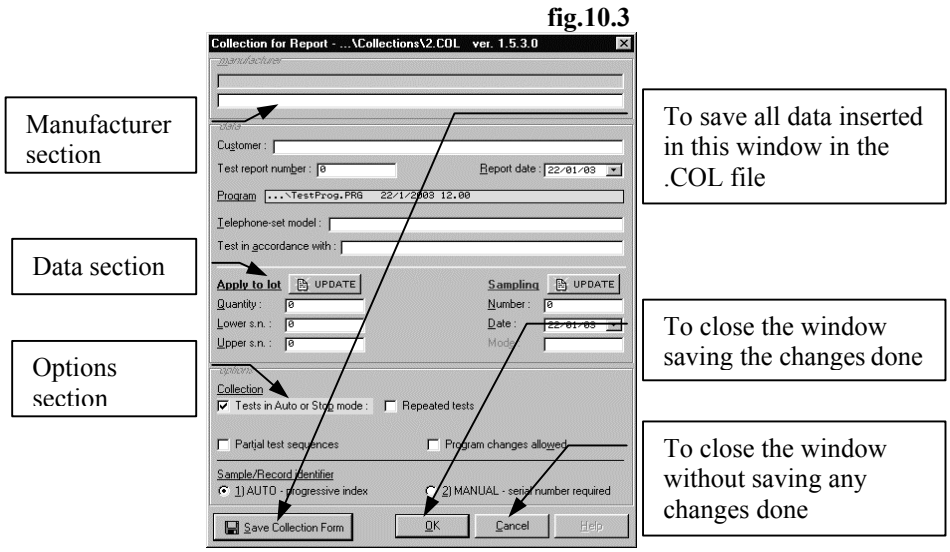
Rename button, that allows modifying a folder name creates by the user, is active only for Test Program **Open** and **Save** commands (see § 4.2).

To create a new folder for data collection, select an inserting point, clicking on a folder shown in the list, and insert a valid name (20 characters max).

If an existing file is selected, System alerts that new data will be appended to it.

After opening or creating a Collection, it is displayed the following window:

fig.10.3



Insert the data requested in **Manufacturer** and **Data** sections.
In the **Options** section, is possible:

- By **Tests in Auto or Stop mode** function, collect data and related parameters, acquired from Tests with Auto or Stop attribute (see § 5.4) only. This option is always active.

- Activating the **Repeated tests** option, collect data and related parameters, also acquired from Tests that have been repeated pressing **F7** Function Key, F7 Repeat button at the bottom of the screen or selecting the corresponding command in the **Execution** Menu.

- Activating the **Partial test sequences** option, collect all data and related parameters, for each Tests completed until user stops the running Test Program by pressing **F8** Function Key, F8 Exit button at the bottom of the screen or selecting the corresponding command in the **Execution** Menu.

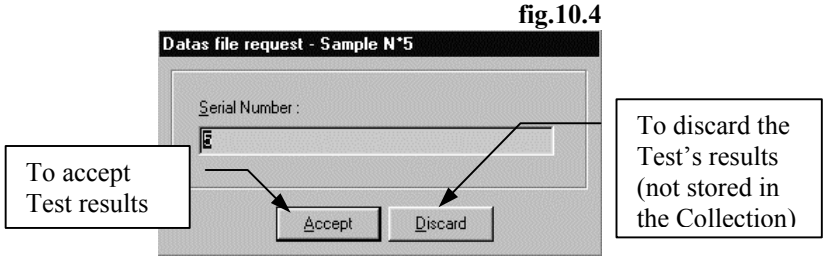
- Activating the **Program changes allowed** option, it is possible to modify the original Test Program and use always the same linked Collection. The changes allowed on the Test Program are concerning Test Attribute and Test **Message** or **Comment** text.

Further, for DUT identification:

- Activating the **AUTO** option, DUT are automatically and sequentially numbered every time that Test Program execution ends.

- Activating the **MANUAL** option, at the end of Test Program execution, is required the manual insertion of DUT serial number. It is possible to insert an alphanumeric string of 19 characters at maximum.

fig.10.4


Datas file request - Sample N°5
Serial Number :
Accept
Discard
To accept Test results
To discard the Test's results (not stored in the Collection)

UPDATE buttons allow to complete automatically the fields in the Data section, reading these information (if available) in the opened Collection.

After completed, and eventually saved, the window of fig.10.3, System turns into Recording mode. On Toolbar is displayed the specific information about the Collection just created.

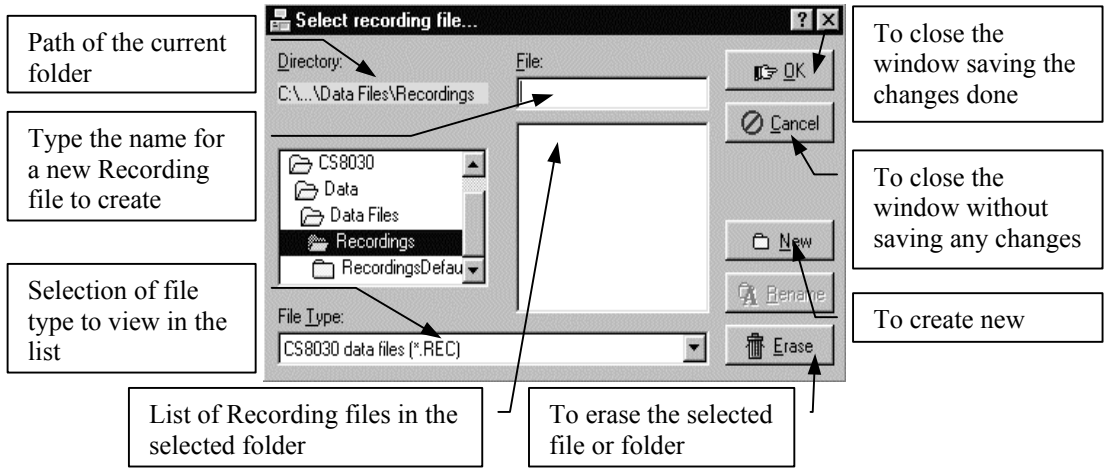
By now, System collects the parameters and results of each running Test.
To stop the data collection, press END button at the bottom of the screen.

10.2.2 Recording for View

The **Recording for View** command opens a new Recording or allows opening an existing one.

The first window that appears is the following:

fig.10.5

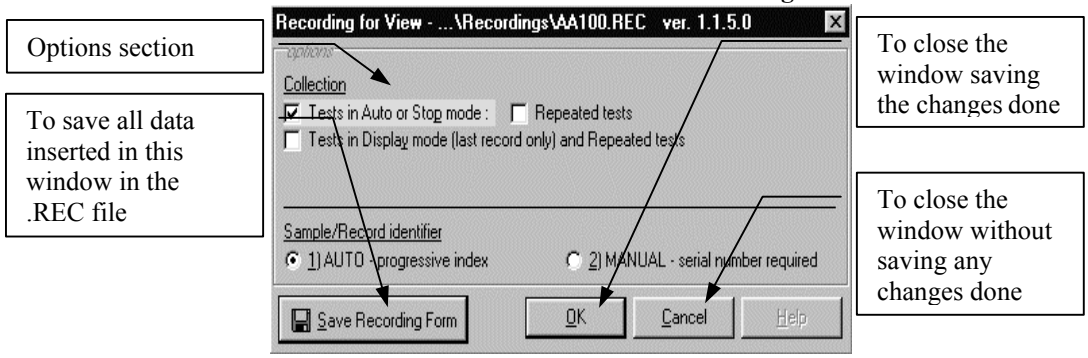


Rename button, that allows modifying a folder name creates by the user, is active only for Test Program **Open** and **Save** options (see § 4.2).

To create a new folder for data collection, select an inserting point, clicking on a folder shown in the list, and insert a valid name (20 characters max).

If an existing file is selected, System alerts that new data will be appended to it.
After opening or creating a Recording, it is displayed the following window:

fig.10.6


Options section
To save all data inserted in this window in the .REC file
To close the window saving the changes done
To close the window without saving any changes done
Recording for View - ...\Recordings\AA100.REC ver. 1.1.5.0
Collection
Tests in Auto or Stop mode :
Repeated tests
Tests in Display mode (last record only) and Repeated tests
Sample/Record identifier
1) AUTO - progressive index
2) MANUAL - serial number required
Save Recording Form
OK
Cancel
Help

In the **Options** section, is possible:

- By **Tests in Auto or Stop mode** function, collect data and related parameters, acquired from Tests with Auto or Stop attribute (see § 5.4) only. This option is always active.

- Activating the **Repeated tests** option, collect data and related parameters, also acquired from Tests that have been repeated pressing **F7** Function Key, F7 Repeat button at the bottom of the screen or selecting the corresponding command in the **Execution** Menu.

- Activating the **Tests in Display mode (last record only) and Repeated tests** option, save data acquired from last repetition of Tests with Display Attribute; if the Test is repeated, a new Record is created.

Further, for DUT identification:

- Activating the **AUTO** option, DUT are automatically and sequentially numbered every time that Test Program execution ends.

- Activating the **MANUAL** option, at the end of Test Program execution, is required the manual insertion of DUT serial number. It is possible to insert an alphanumeric string of 19 characters at maximum.

After completed and eventually saved, the window shown in fig.10.6, the System turns into Recording mode. On Toolbar are displayed the specific information about the Recording just created.

From that point on the System saves parameter and result of each running Test.

To end the data Collection, press END button at the bottom of the screen.

10.2.3 Edit Collection/Recording

The **Edit Collection/Recording** command allows modifying an existing Collection or Recording. This command is active only when the System is in Recording or Viewing mode (see § 4.1).

Select a Collection or Recording to view; the corresponding window of fig.10.3 or fig.10.6 is displayed. It's possible to make changes to all data included. To save permanently the changes done, press **Save Collection Form** or **Save Recording Form** button. Otherwise, pressing **OK** button, data will be saved temporarily, and at the end of Collection or Recording process, all the changes will be deleted.

10.2.4 End Collection/Recording

The **End Collection/Recording** command stops a Collection or Recording execution.

This command is active only when the System is in Recording mode (see § 4.1).

To do the same action, it is possible also press END button at the bottom of the screen.

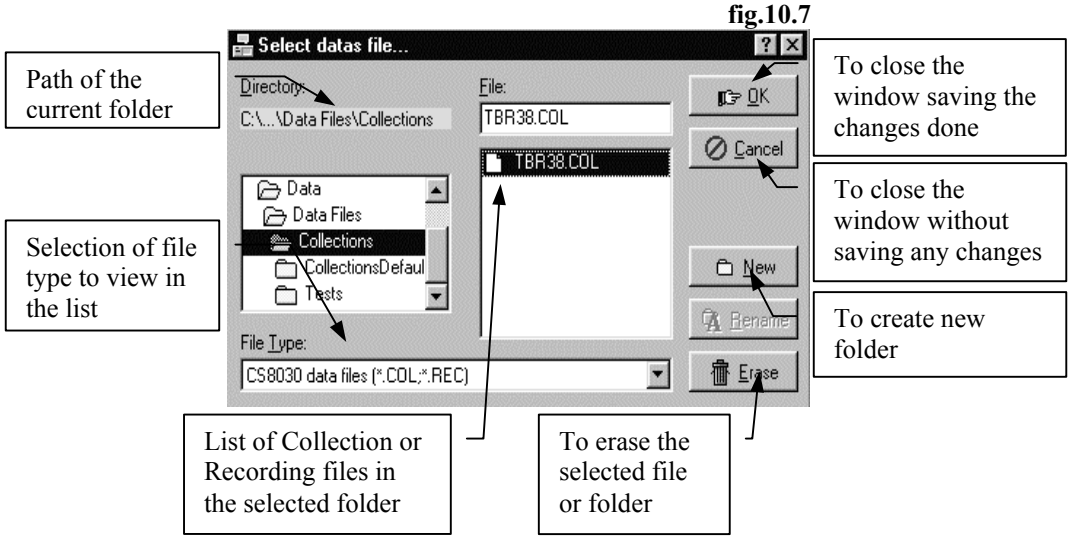
10.2.5 View Data File

The **View Data File** command displays the results saved in a Collection or Recording.

This command is not active when the System is in Recording mode (see § 4.1).

It is displayed the following window:

fig.10.7



Rename button allows modifying a customer folder's name; it is active only for Test Program **Open** and **Save** commands (see § 4.2).

Select a Collection or Recording to view; the corresponding window of fig.10.3 or fig.10.6 is displayed. It's possible to perform like described in the **Edit Collection/Recording** section on this Chapter.

The System turns into Viewing mode (see § 4.1).

On Toolbar, specific information about the Collection or Recording just selected, are displayed. At the bottom of the Main Window, there are two scroll bars, for Sample and Record respectively. With them, it is possible to select for viewing each Sample and its linked Record, saved during Collection or Recording execution. Results are displayed on **Graphic Response**, **Results Table** and **Verdict** windows placed on desktop. Moreover, at the bottom of the screen, there are **Test Condition** (see § 10.2.7) and **Print Results** (see § 10.3.6) buttons; this last button allows a quick print of selected Sample's results.

To end viewing of one Collection or Recording, press END button at the bottom of the screen or select in **Collection/Recording** Menu, the **End View Data File** command.

10.2.6 End View Data File

The **End View Data File** command ends the viewing of stored results in a Collection or Recording.

This command is active only when the System is in Viewing mode (see § 4.1).

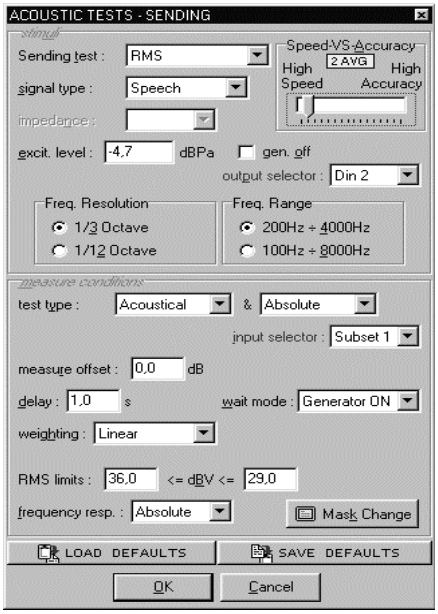
10.2.7 Test Condition

Test Condition command displays the specific parameter of Tests included in the active Test Program.

This command is active only when the System is in Viewing mode (see § 4.1).

It is displayed the following window:

fig.10.8



For parameters and buttons description shown on this window, please refer to Chapters 7,8 and 9.

10.2.8 Import Collection/Recording

The **Import Collection/Recording** command imports from Floppy Disk a Collection or Recording.

Insert a Floppy Disk where Collection (.COL extension) or Recording (.REC extension) files are saved.
On the dialog window that appears, select the file to import; this file will be saved in a folder with same name and path of the original one.

10.2.9 Export Collection/Recording

The **Export Collection/Recording** command exports on Floppy Disk a Collection or Recording.

At first, insert a Floppy Disk and verify that sufficient memory exists on it to store all data.
Collection or Recording files on disk are respectively with .COL or .REC extension.

10.2.10 Convert Collection/Recording

Convert Collection/Recording command converts the selected Collection or Recording, into a text or Microsoft Excel file.

Selecting the Collection or Recording to convert, the window of fig.10.3 or fig.10.6 (depends on the previous selection) is shown again. It's possible to operate like described in the **Edit Collection/Recording** section on this Chapter.

If convert to a text file has been selected, pressing **OK** button, a Menu appears with the following options:

Test Parameters	If ON, in the conversion file, the specific parameters of each Test, are included
Frequency Response	If ON, in the conversion file, the results of each Test, are included
Tabbed Format	If ON, in the conversion file, all data will be tabbed, so it can be easy opened by another program

Otherwise, if convert to for Excel has been selected, pressing **OK** button, a Menu appears with the following options:

Frequency Number	If NORMAL FREQUENCIES, in the conversion file, the results of all Frequencies for Distortion Test, are not included
Heading	If SHOW, in the conversion file, the additional information of the Collection/Recording, are included

Press **Convert** to convert the Collection/Recording into the specified format.

10.3 Print

Following are described all the commands in the **Printer** Menu placed on the **Main Menu** (see § 4.5).

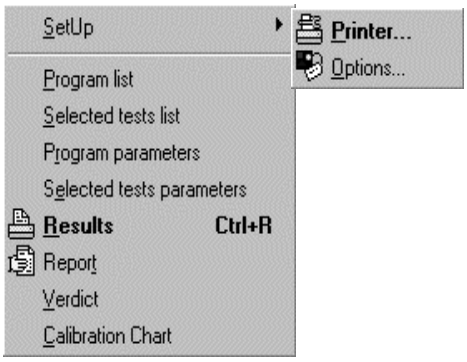


fig.10.9

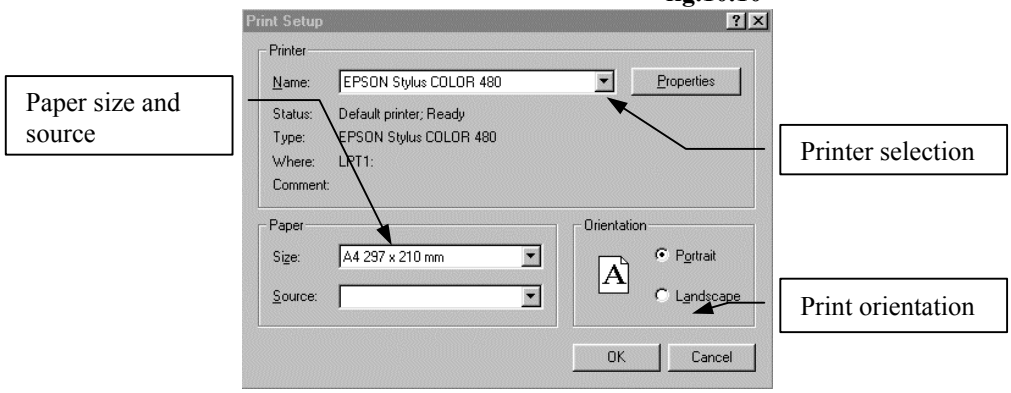
10.3.1 Setup

It is displayed the Submenu with **Printer** and **Options** commands.

Printer

The System displays the following window:

fig.10.10



By this window is possible to select the printer to use, paper size and print orientation.

Pressing **OK** button, the current settings are saved; pressing **Cancel** button instead, the window is closed without saving any settings.

Options

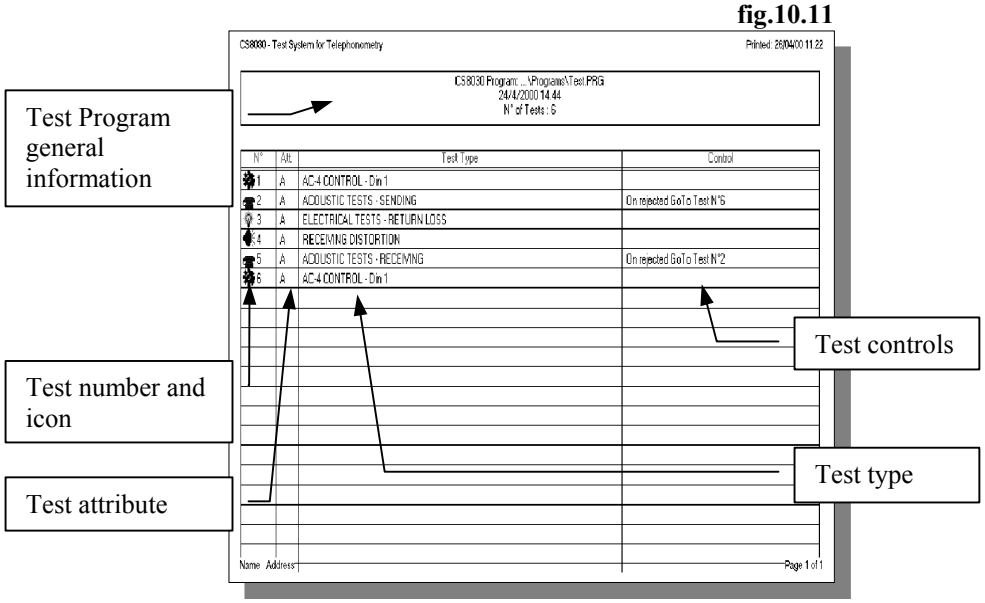
The System displays the window described in § 6.1.6.

10.3.2 Program list

Print the complete list of Tests, with their Controls and Attributes that are included in the active Test Program.

Appears the dialog window shown in fig.10.10. After parameters setting, pressing **OK** button, the System starts the print process. An example is shown in the figure below:

fig.10.11


CS8030 - Test System for Telephonometry
Printed: 26/04/00 11.22
CS8030 Program: ...\Programs\Test.PRG
24/4/2000 14.44
N° of Tests : 6
N° | Att. | Test Type | Control
1 | A | AC-4 CONTROL - Din 1 |
2 | A | ACOUSTIC TESTS - SENDING | On rejected GoTo Test N°6
3 | A | ELECTRICAL TESTS - RETURN LOSS |
4 | A | RECEIVING DISTORTION |
5 | A | ACOUSTIC TESTS - RECEIVING | On rejected GoTo Test N°2
6 | A | AC-4 CONTROL - Din 1 |
Name Address
Page 1 of 1
Test Program general information
Test number and icon
Test attribute
Test controls
Test type

10.3.3 Selected tests list

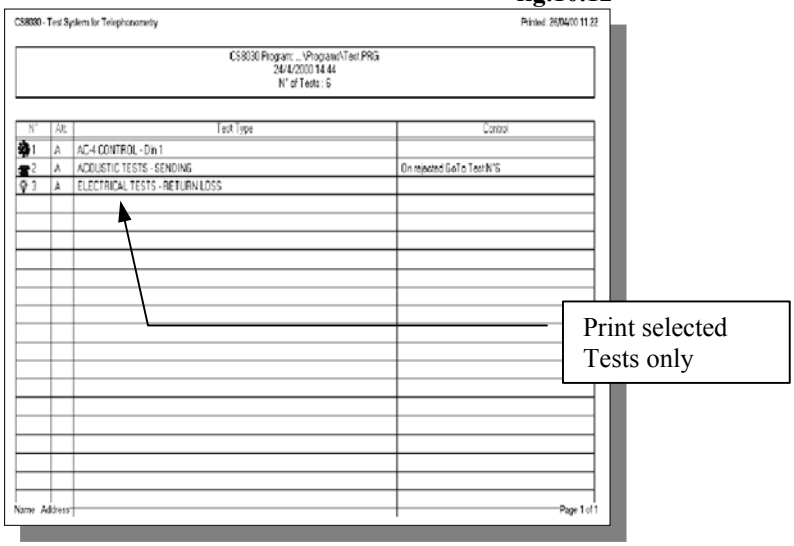
Print the list of selected Tests, with their Controls and Attributes that are included in the active Test Program.

To select one or more Tests, hold down the **Shift** key and clicking on Test's icon.

Appears the dialog window shown in fig.10.10. After parameters setting, pressing **OK** button, the System starts the print process.

Selecting for example, only the first three Tests in the Test Program shown in fig.10.11, the output is:

fig.10.12

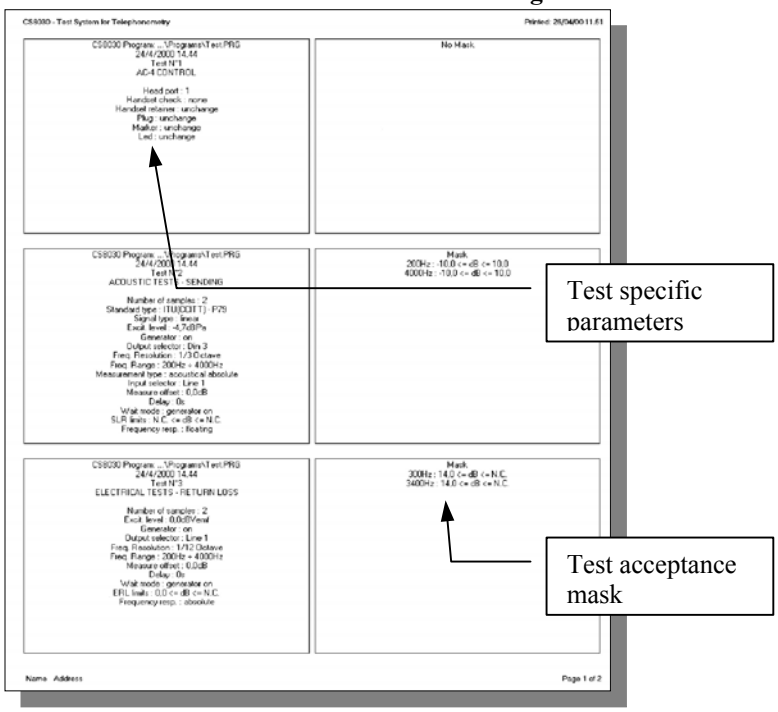

CS8030 - Test System for Telephonometry
Printed: 26/04/00 11.22
CS8030 Program: ...\Programs\Test.PRG
24/4/2000 14.44
N° of Tests : 6
N° | Att. | Test Type | Control
1 | A | AC-4 CONTROL - Din 1 |
2 | A | ACOUSTIC TESTS - SENDING | On rejected GoTo Test N°6
3 | A | ELECTRICAL TESTS - RETURN LOSS |
Name Address
Page 1 of 1
Print selected Tests only

10.3.4 Program Parameters

Print all the parameters of each single Test that is included in the active Test Program.

Appears the dialog window shown in fig.10.10. After parameters setting, pressing **OK** button, the System starts the print process.
An example is shown in the following figure:

fig.10.13



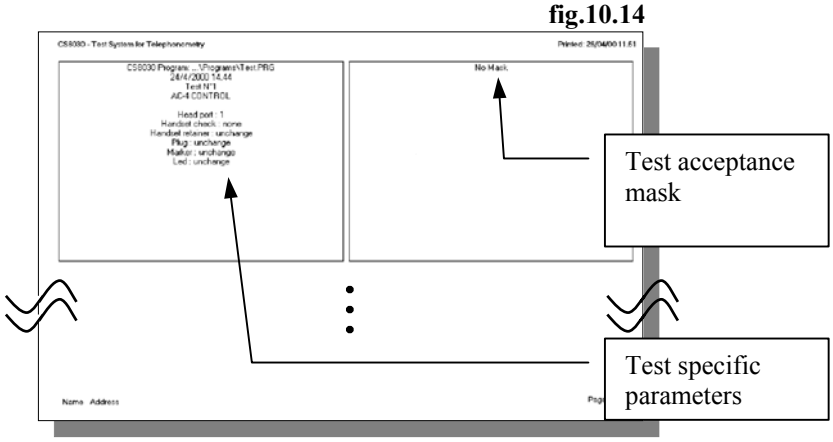
10.3.5 Selected tests parameters

Print all the parameters of selected Tests that are included in the active Test Program.

To select one or more Tests, hold down the **Shift** key and clicking on Test's icon.

Appears the dialog window shown in fig.10.10. After parameters setting, pressing **OK** button, the System starts the print process. Selecting for example, only the first Test in the Test Program shown in fig.10.11, the output is:

fig.10.14

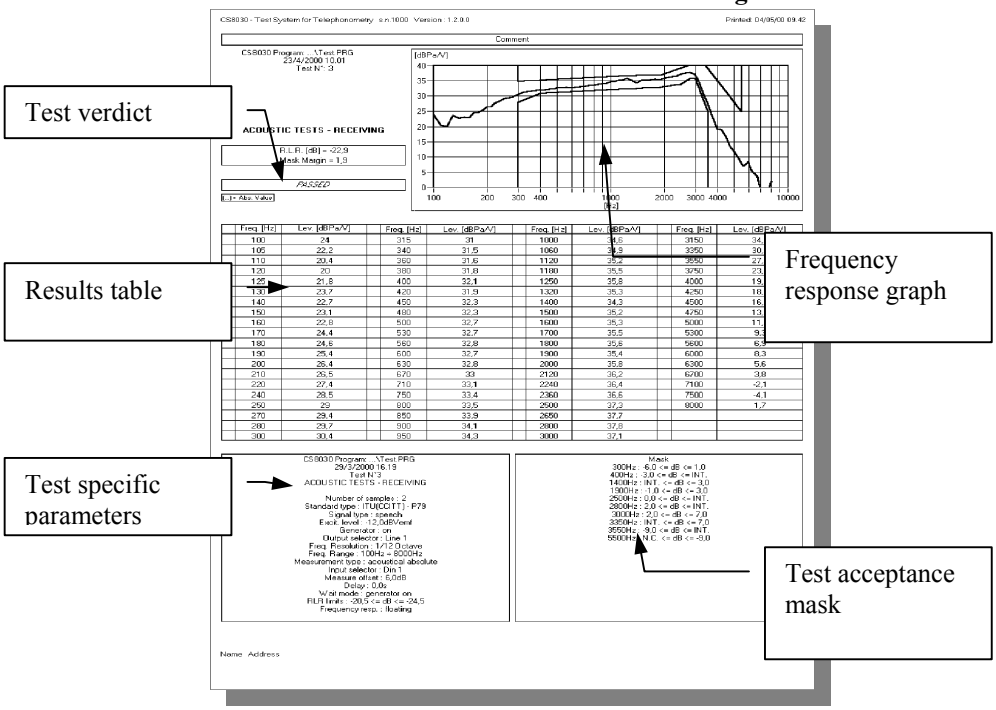


10.3.6 Results

Print the result table and frequency response graph of the last executed Test in the active Test Program.

To print the results of all Tests in the current Test Program is needed to create a Collection, like shown in § 10.2.1, and print from it the results of each single Test.
The following figure shows an example of Results format:

fig.10.15



10.3.7 Report

Print the Collection Report.

Appears the dialog window shown in fig.10.2. After selecting the desired Collection file, the window of fig.10.3 is shown. Continue like described in § 10.2.3.

Pressing **OK** button to active a Menu with the following options:

Repeated serial number	When it's checked the MANUAL function for DUT identification and there are more than one devices with same serial number in the selected Collection.
Last sample only	Are printed out only the results of the last sample
All samples	Are printed out the results of all samples

Statistics	The System calculates mean value, Standard Deviation, min and max value of Loudness Rating and Mask Margin.
All values	For the statistic calculus, all samples are included
Inside limits only	For the statistic calculus, only the samples inside the Test acceptance limits are included
Print	
Statistics only	Is printed out only the statistic section
All sample results	Is printed out the statistic section and all the results (500 samples maximum)

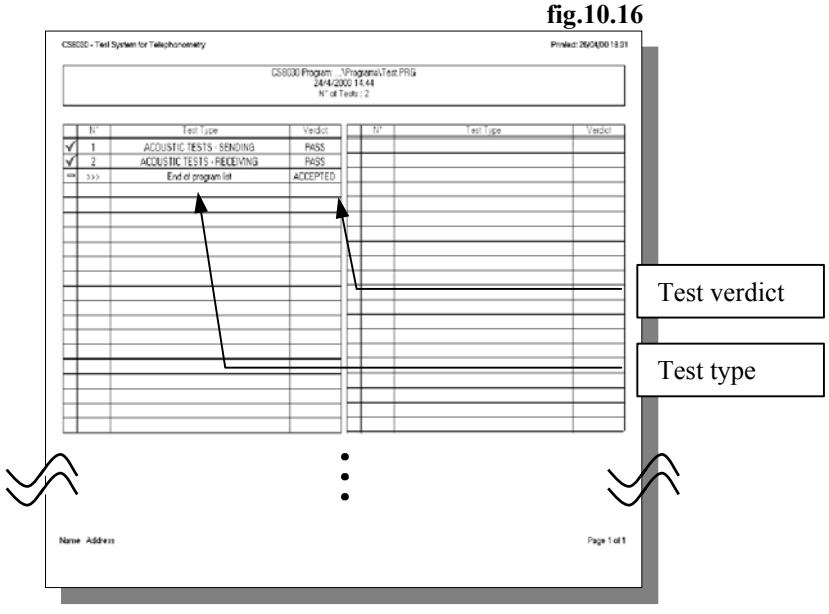
Selecting **PRINT** command, the Report is printed.

10.3.8 Verdict

Print verdict of Tests included in the active Test Program.

Test with Excluded attribute (see § 5.4) are not considered.
The following figure shows an example of Verdict format:

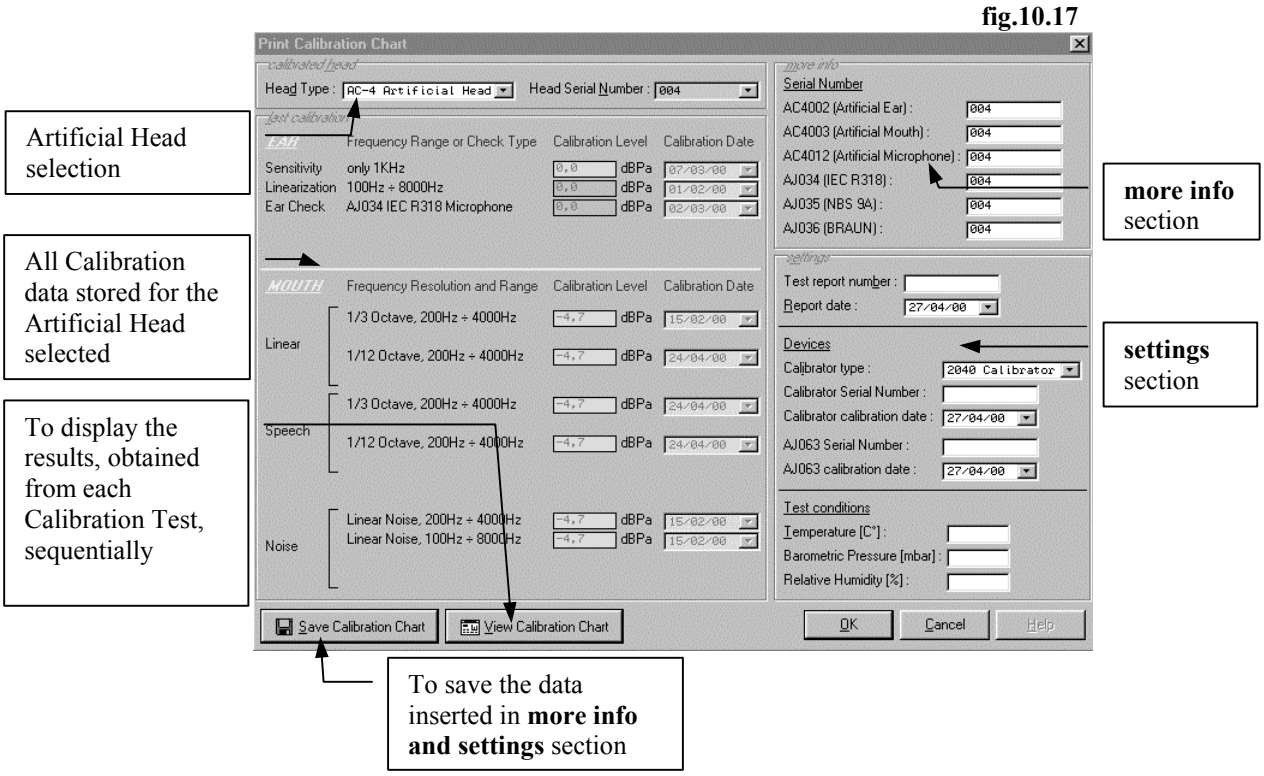
fig.10.16



10.3.9 Calibration Chart

Print the calibration chart of AC-4 and AC-3 Artificial Head (see § 12).

fig.10.17



First, select the Artificial Head. If its calibration chart has never been completed in **more info** and **settings** sections, the System shown an alert message.

All Calibration data stored for the Artificial Head selected are shown on the screen.

Press **OK** button to active a Menu with the following options:

Print	
Ear Calibrations	If checked, are printed out all the data of Artificial Ear section
Mouth Calibrations	If checked, are printed out all the data of Artificial Mouth section

Selecting **PRINT** command, data and results of the previously selected sections (displayed on window of fig.10.17), are printed out.

Chapter 11

MAINTENANCE

11.1 Generals

A correct use of the System can, usually, avoids damage causes and therefore expensive machine working stop.

- **Ventilating**

  Periodically, the correct working of the air fan on the rear of the System, needs to be verified; in particularly dusted working environment, provide at its and all equipment cleaning every 6 months at least.

- **Recalibrations**

  The instrument when comes out from Factory, is perfectly calibrated, after a 48 hours Burn-In at least.

  It is advisable to perform the whole Calibration and Functional checks (§ 11.2) every 2000 working hours or in any case by annual periodicity.

11.2 Calibration and Functional checks

11.2.1 Preliminary

- Connect all the peripherals to the System (mouse, keyboard, monitor) and turn on the CS8030.
- Verify operation of:
  - ✓ RAM (automatic test at start up)
  - ✓ Monitor
  - ✓ CS8030 program auto start
  - ✓ Mouse
  - ✓ Keyboard

11.2.2 Floppy Disk drive check

- To check writing, create a new Test Program (name it "**TEST.PRG")**, inserting one or more test of any type, and export it on "A:" (**FILE** menu ⇒ **EXPORT**).
- To check reading, use **IMPORT** function in the **FILE** menu; save on CS8030 the program "**TEST"** with its original name.
- Then, delete the program **"TEST"** from CS8030's memory.

11.2.3 Electrical checks

Required equipments:

J30-4
Electronic Multimeter with 4 ½ digit at least

- Remove the upper panel (4 screws) of CS8030.
- Verify the correct functioning of micro and power supply's fans.
- Insert into one free ISA slot the board for supply voltage measurement **(J30-4)**.
- Check:

Output voltage	Tolerance
+5Vdc	± 5%
+12Vdc	± 5%
-5Vdc	± 10%
-12Vdc	± 10%

- Turn off the System.
- Verify, by multimeter, the continuity between ground terminal on the rear panel of the System (⏚) and the ground terminal of the System's male plug (always on the rear panel). The measured resistance should be about 0Ω.
- Close and fix the upper panel.

11.2.4 DIN connectors check

Required equipments:

XJ30-1
XJ30-2
AC-4 Artificial Head or AC-4005 (optional)
Oscilloscope
Floppy Test8030 with DIN_TEST_eng program

- Import **DIN_TEST_eng** program from floppy as described on § 11.2.2. Follow the instructions shown during program execution[1].
  At the end, check ±15V supply voltages using **XJ30-1** cable on every DIN connector (Tolerance ±0.5V).
- Check the **digital IN/OUT** by connecting an AC-4 Artificial Head or an AC-4005 to the System, and perform the automatic recognition using the **DIN PORT** tab in the **ENVIRONMENT OPTIONS**.

  If an AC-4 or AC-4005 is not available, start one acoustic calibration of an AC-3 Artificial Head with CS2036 Acoustic Calibrator (as described on § 12.3) without connection, and select only **sensitivity** test. Start the calibration procedure and check that **"noise or calibrator problem"** message appears.
  Therefore check that connecting **XJ30-2** cable (which connect to ground the digital **IN** - PIN 7) to the DIN on which is virtually connected the CS2036 the message disappears.
  For digital **OUT**, connect the oscilloscope on output of **XJ30-2** cable (PIN8 and PIN2 of DIN connector) and check the presence of a pulse train when an automatic recognition is performed (using **DIN PORT** tab in the **ENVIRONMENT OPTIONS**).
- Exit from calibration and repeat the test for every other DIN connector.
- Disconnect **XJ30-2** cable.

11.2.5 SUBSET connectors check

Required equipments:

600Ohm 1% Resistance
XJ30-3
Floppy TEST8030 with SUBSET_TEST_eng program

- Import **SUBSET_TEST_eng** program from floppy and follow the instructions shown during program execution[1].
  NOTE: With an incorrect Switch positioning, there aren't measure errors but it's skipped the check of one of the two channels.

11.2.6 COM port check

To be performed in factory only.

[1] To check if DIN and SUBSET connectors are working properly, Receiving, Sending and Side-Tone Tests are used. So, it's possible to check the correct functioning of DSP board also.

11.2.7 IEEE488 port check

Required equipments:

IEEE-488 cable
PC configured as “Controller”

- Connect CS8030 to one PC, configured as **Controller**, by cable and IEEE port, placed on the rear panel of the System.
  NOTE: the PC must have the **IEEE** port already mounted on with correct driver installed.
- Turn on the System under test and set it as **Listener** (**SETUP** menu ⇒ **SET CS8030 AS LISTENER (IEEE488)**).
- From PC configured as **Controller**, send commands to CS8030 and verify the communication between them, in according to the protocol shown in Appendix 2.
- At the end, remove the **Listener** option on CS8030 and disconnect the IEEE cable.

11.2.8 PRINTER port check

Required equipments:

Graphic printer

- Connect CS8030 to the printer. Use one printers already installed on the System or install the drivers for the desired one (**PRINTER** menu ⇒ **SETUP** ⇒ **OPTIONS** ⇒ **ADD PRINTER**).
- Select one item in the **PRINTER** menu and print.
  NOTE: some items are available only when one program is opened.

11.2.9 NETWORK port and board check (If installed)

To be performed in factory only.

11.2.10 Feeding Bridge check (If installed)

Required equipments:

Electronic Multimeter with 4 ½ digit at least
Floppy TEST8030 with FEED_TEST program

- Short-circuit the Rf binding posts.
- From TEST8030 floppy, launch the FEED_TEST program and follow the instructions. Measure the values at ±70Vdc and ±60Vdc on pin 1 and 2 (**a** and **b**) of SUBSET1.

Output voltage	Tolerance
+70Vdc	± 250mV
-70Vdc	± 250mV
+60Vdc	± 500mV
-60Vdc	± 500mV

- To check the 50V limiter circuit, program a FEEDING BRIDGE test; at ±49Vdc the buzzer must not function, at contrary of when programming ±51Vdc (without the protection jumper on the SUBSET connector).

Chapter 12

ELECTRO-ACOUSTICAL CALIBRATION

12.1 Generals

The Electro-Acoustical Calibration is necessary when:

- Use for the first time CS8030 System
- System working site is changed
- Connect to the System a new Artificial Head

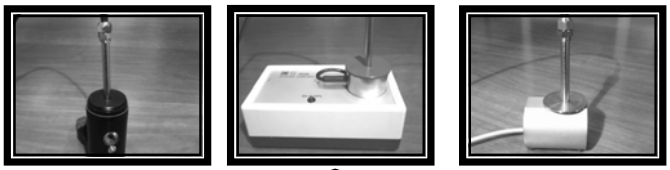
AC-3 or AC-4 Artificial Head calibration consists of the following operations:

1. **Artificial Ear check and calibration.**

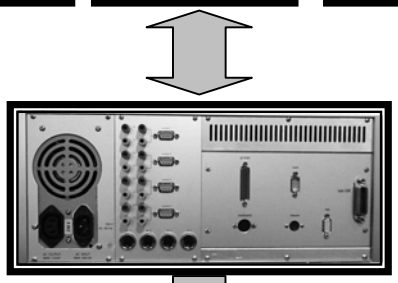
2. **Artificial Mouth check and calibration.**

12.1.1 Artificial Ear check and calibration.

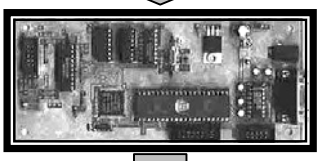
For this purpose, pressure references (electro-acoustical Calibrators) are used. They supply a pressure value of 1N/m^2 (94dBSPL). The signal, from Artificial Ear microphone, is amplified and sent to the interface board input for measure. From here the analog signal is sent to DSP board where is converted to digital. The CPU board displays the results displayed on screen.



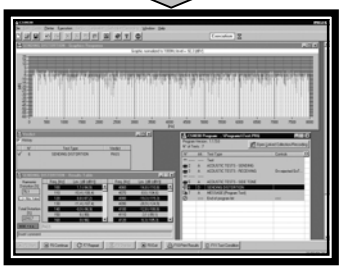
Electro-Acoustical Calibrators



CS8030 Interface Board



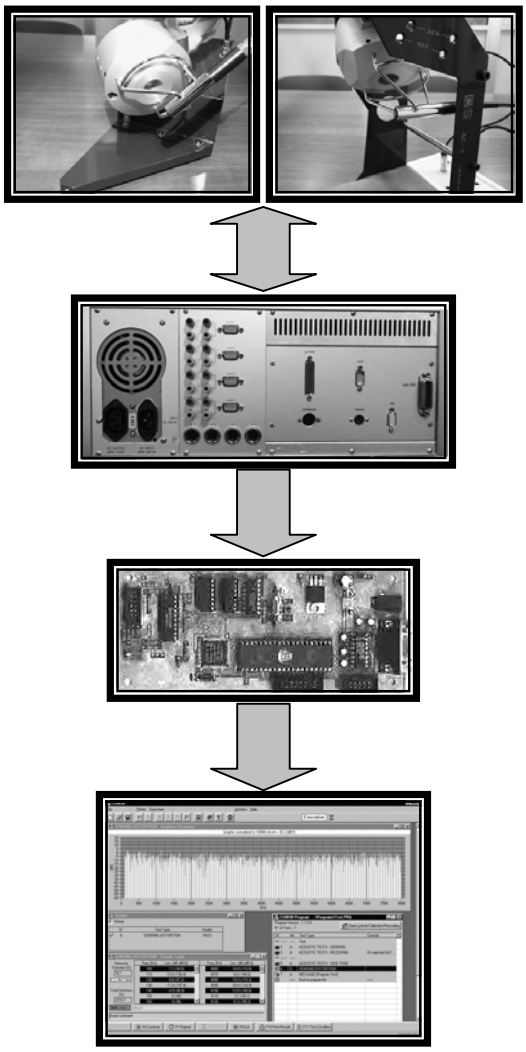
DSP+CPU Boards



Monitor

12.1.2 Artificial Mouth check and calibration.

This operation is made by microphone of the Artificial Head already calibrated, placing it in front of the Artificial Mouth, to measure the output pressure, in according to the used standard (see App.1-Tab.1&2). After calibration, the pressure produced by the Artificial Mouth has the desired value, for all the spectrum frequencies. For noise calibration, it is measured the difference between the actual value of pressure and the nominal value; this difference is stored to correct, eventually, the measured value during the Tests (only for Noise RMS Test).



12.2 Start of Procedures

Following the procedures in the **Calibration** Menu, placed on the **Main Menu,** it is possible to perform an electro-acoustical calibration of CS8030 System's devices, like AC-3 and AC-4 Artificial Heads.

The conventions used in this chapter are listed below:

Bold	Bold text denotes menu, menu items and buttons or test name
✓	This icon to the left of text denotes a manual operation
ⓘ	This icon to the left of text denotes a note, which alerts to important information
⊗	This icon to the left of text denotes an error description

ATTENTION: every Test selected and performed, will overwrite its old Calibration results.

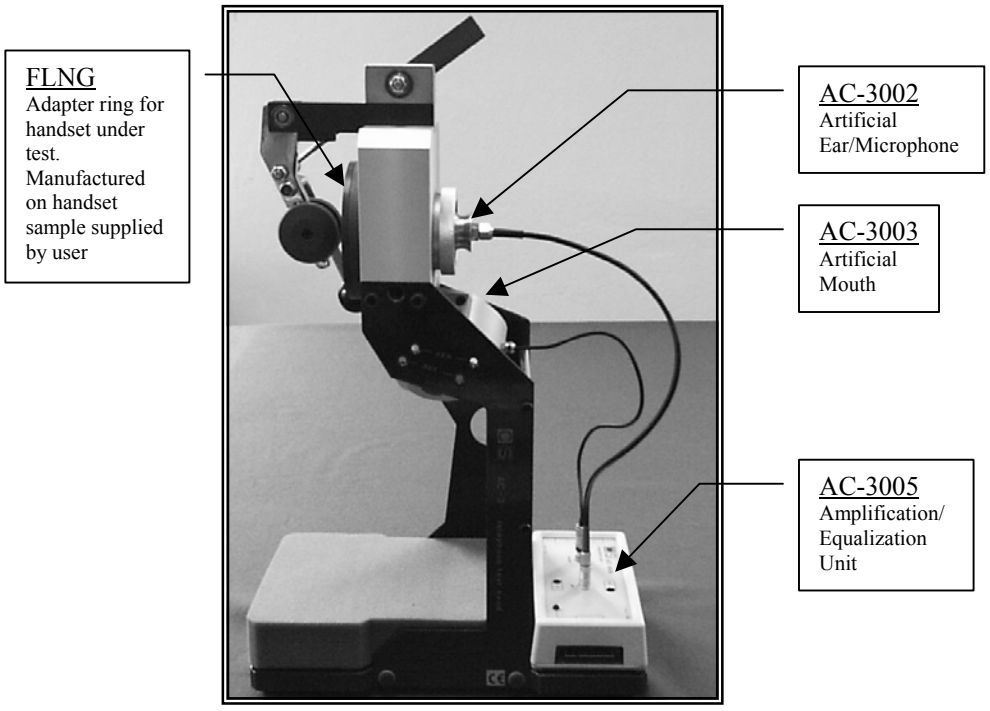
12.3 AC-3 Artificial Head Calibration

12.3.1 Test set needed

Electro-acoustical calibration needs of a test set with accuracy one order higher then AC-3 Artificial Head characteristics.

Different calibration methods are foreseen in according to different rules, particularly for AC-3003 Artificial Mouth. For parameters and methods see Appendix 1 – Tab.1&2.

AC-3 Head main parts



Ear Calibration

Artificial Ear calibration needs the following tools:

CS2036 BOX	Calibration box with multifrequency pressure Calibrator (range 200 ÷ 4000Hz)
CS2040 BOX	Calibration box with multifrequency pressure Calibrator (range 100 ÷ 8000Hz)

or, only for microphone sensitivity calibration, it is possible to use:

B&K 4230	1000Hz/1Pa Pressure Calibrator
B&K 4231	1000Hz/1Pa Pressure Calibrator

Mouth Calibration

Mouth Calibration methods (see Appendix 1-Tab.1&2), are different for:
- Weighting of test signal.
- Position and type of measuring microphone.

In the following table, are shown the tools and measuring instruments needed in according to the signal type used for calibration.

tab.12.3.1

Signal Type	**Instruments**	**Notes**
Linear & Speech[1]	CS8030 System	Calibrated
	AJ-042	Support for calibration microphone
	AC-3002	Artificial Ear/Microphone for AC-3 Head
SFERT[2]	CS8030 System	Calibrated
	AJ-044	SFERT Reflector
	AC-3002	Artificial Ear/Microphone for AC-3 Head

[1] Calibration methods for Artificial Mouth used in UIT-T, BSI, IEEE standard

[2] Calibration methods for Artificial Mouth used in OREM-A, DIN44013 (OREM-B) standard

12.3.2 Artificial Ear Calibration

To check an AC-3 Artificial Head, a calibrated CS8030 System is needed (see § 11).

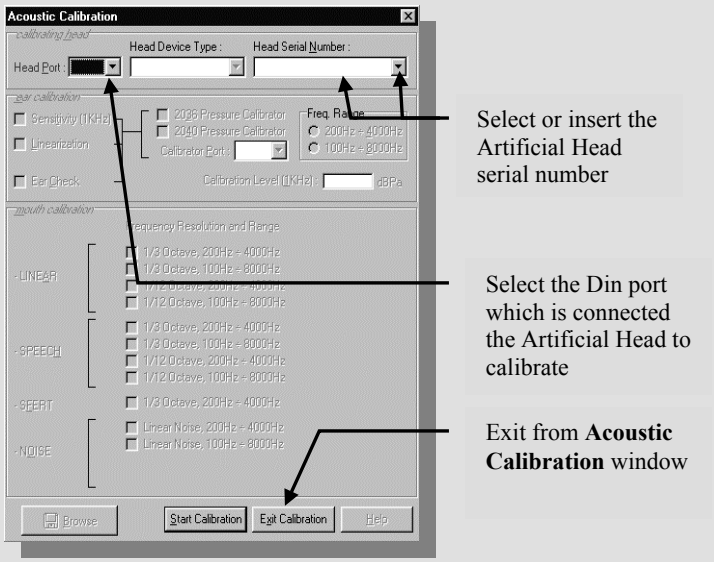
The following procedures allow checking and eventually correcting, the sensitivity, frequency response linearity of AC-3002 Artificial Ear microphone and checking for Ear cavity (AJ-034, AJ-035, AJ-036).

✓ Set CS8030 System in Stand By mode (see § 4.1) and connect AC-3 Artificial Head to the desired Din connector by the X109-2 cable.

✓ Select the **Calibration** Menu from **Main Menu**.

✓ Appears the **Acoustic Calibration** window. Select the Din port which is connected the Artificial Head to calibrate.
*Otherwise, is possible to select the Head serial number in the list and automatically will appear, in the **Head Port** and **Device Type** box, the corresponding data.*

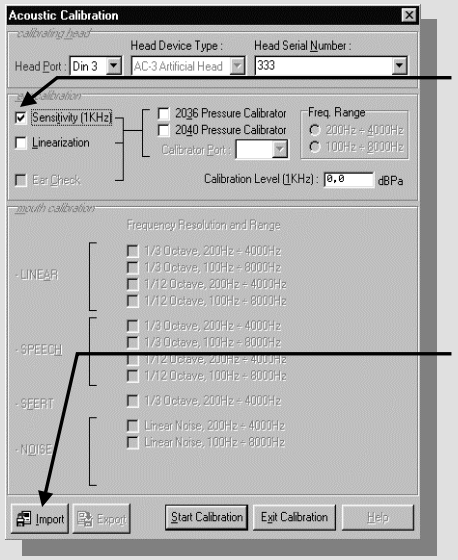
✓ Select or insert, in the **Head Serial Number** box, the Artificial Head serial number. If the Head has never been calibrated with the System in use or its calibration data have never been imported, is needed to insert the serial number manually (24 numbers at maximum), or search it on a Floppy Disk where, with another System, have been already stored its calibration data. For this function, use the **Browse** button that appears on the window after selecting a Din port. A dialog box will be shown. Select the "AC-3 Artificial Head" folder. In the list, open the folder with name corresponding to the Head's serial number that is connected to the System, and select the "Calibration.def" file.
From this point a new calibration session starts.



ⓘ If the System already has, for the Artificial Head under test, some valid calibration data, they are highlighted with yellow color.

It is possible to select any of the available tests that are described in the following pages.
Otherwise, for a first execution of the calibration procedure with new Artificial Head, please follow, in the order, the steps below:

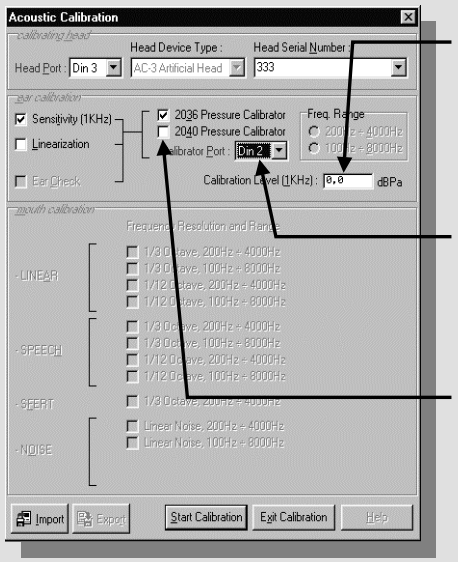
✓ Select, in the **Ear Calibration** section, the **Sensitivity (1KHz)** Test, now available. It is the calibration procedure for 1000Hz sensitivity of measuring microphone.



Selection of **Sensitivity (1KHz)** Test

Import the calibration data, from Floppy Disk, for the Artificial Head under test (if there are).

✓ Select the electro-acoustical Calibrator that is used in the procedure. Specify the model, the Din port which is connected to, by the X109-2 cable, and eventually the corrective value for **Calibration Level (1KHz)**, in the range of -34,5 ÷ 13,8dB$_{Pa}$, that is used to compensate the difference between Calibrator real emission and the reference value of 94dB$_{SPL}$. If it is used an external Calibrator (mod. B&K4230 or B&K4231) and only the **Sensitivity (1KHz)** Test will be execute, no selections are needed.

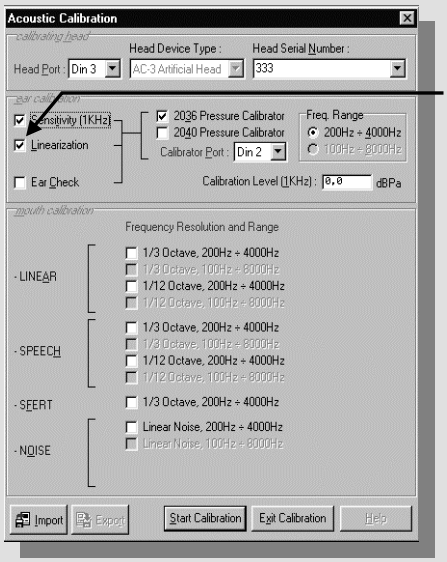


Calibration Level (1KHz) setting

Din Port which is connected the selected Calibrator

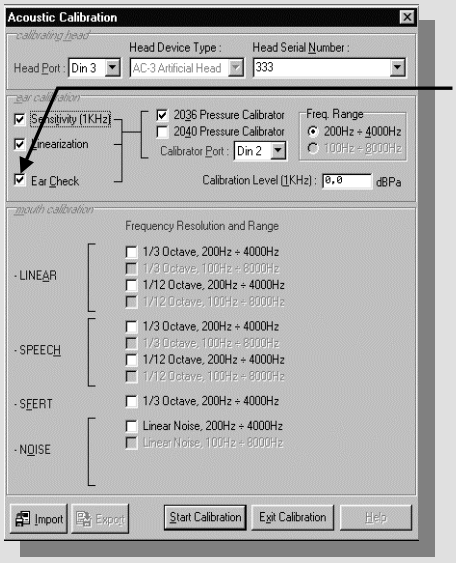
Selection of electro-acoustical Calibrator used

✓ Select, always in the **Ear Calibration** section, the **Linearization** Test, now available. It consists in the linearization procedure of frequency response between 200 and 4000Hz, for the measuring microphone.



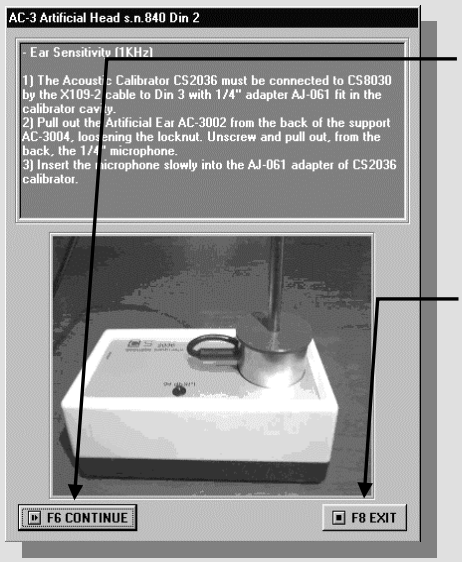
Selection of **Linearization** Test

✓ Select, always in the **Ear Calibration** section, the **Ear Check** Test. It consists in the check procedure for acoustic impedance of Artificial Ear, that is the Ear cavity used (i.e. AJ-034 for IEC R318). This test is necessary when the complex cavity may be dirty or broken.



Selection of **Ear Check** Test

✓ Click on **Start Calibration** button to start the calibration procedure. CS8030 System shows the operations to correctly arrange all parts involved in the procedure.


AC-3 Artificial Head s.n.840 Din 2
- Ear Sensitivity [1KHz]
1) The Acoustic Calibrator CS2036 must be connected to CS8030 by the X109-2 cable to Din 3 with 1/4" adapter AJ-061 fit in the calibrator cavity.
2) Pull out the Artificial Ear AC-3002 from the back of the support AC-3004, loosening the locknut. Unscrew and pull out, from the back, the 1/4" microphone.
3) Insert the microphone slowly into the AJ-061 adapter of CS2036 calibrator.
F6 CONTINUE
F8 EXIT
Test execution
Exit from calibration procedure

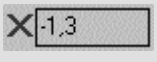
ⓘ Closing the procedure is possible to save all the calibration data of the Artificial Head under test, already collected in the current session. In the dialog box that is shown after pressing the **Exit** button or **F8** Function Key, selecting **Yes**, will be saved all the calibration data collected in the previous tests eventually performed in the current calibration procedure.
Selecting **No** will be deleted from the System memory, all the calibration data collected in the current calibration procedure.
Selecting **Cancel**, the System comes back to the procedure without execute any action.

ⓘ During test performing, is possible to show the results opening the **Results Table** window placed on Desktop. Messages, at the bottom of this window, will inform the operator if the System has detected a measure error or if the test is inside the acceptance limits.

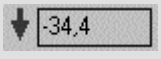
⊗ If the error message "Noise or calibrator problems" appears, be sure that microphone under test is correctly inserted into the Calibrator and also that is selected the right Din port; if the message still appears, exit from procedure and restart the test.

⊗ If the error message "Acoustic Noise" appears, means that the System has detected a quick variation of the measured value; this variation must be more than ± 0,1dB in a time period of about 100ms
Be sure that the microphone under test is correctly inserted into the Calibrator and the workbench has no vibrations during the measure; if the message still appears, exit from procedure and restart the test.

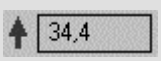
The System shows with symbols, near measures, the error type:



Not constant value (acceptance range: ± 0,1dB for a time period of about 100ms).



Value under low limit



Value over high limit

Following, are described all the tests for the Artificial Ear calibration.

1) Sensitivity (1KHz) Test

✓ Arrange the CS2036 or CS2040 Calibrator, connected to the System, with AJ-061 (CS2036) or AJ-064 (CS2040) 1/4" microphone adapter, inserted in the calibration cavity.
Otherwise, arrange the Calibrator B&K4230 or B&K4231 with 1/4" B&K adapter.
Pull out the AC-3002 Artificial Ear from the back of AC-3004 support, loosening the locknut. Unscrew and pull out from back the 1/4" microphone and insert it slowly[3] into the adapter hole of Calibrator CS2036, CS2040 or B&K4230/1 used.

✓ Press **Continue** button or **F6** Function Key.

The Calibrator supplies 94dB$_{SPL}$ at 1KHz. The Artificial Head's microphone detects it with a little imprecision, due to own characteristics. The System saves this value to correct all the measures that will be performed with the Artificial Head under test.

⊗ If the error message "Noise or calibrator problems" appears, after checking the electrical and acoustical connections, adjust the trimmer 'e' on AC-3005 unit to obtain the value of 0dB$_{Pa}$.

✓ At the end of Test performing, rearrange correctly all the Head's parts (AC-3002, AC-3004, microphone, etc.).

---

2) Linearization Test

✓ Arrange the CS2036 or CS2040 Calibrator, connected to the System, with AJ-061 (CS2036) or AJ-064 (CS2040) 1/4" microphone adapter, inserted in the calibration cavity.

✓ Pull out the AC-3002 Artificial Ear from the back of AC-3004 support, loosening the locknut. Unscrew and pull out from back the 1/4" microphone and insert it slowly[3] into the adapter hole of Calibrator CS2036, CS2040 or B&K4230/1 used.

✓ Press **Continue** button or **F6** Function Key.

The System starts to explore all the frequencies from 200Hz to 4000Hz (ISO 266 - 1/3 octave); for each one the dB value, normalized to 1000Hz, is given.

✓ At the end of Test performing, rearrange correctly all the Head's parts (AC-3002, AC-3004, microphone, etc.).

---

3) Ear Check Test

✓ Pull out the AC-3002 Artificial Ear from the back of AC-3004 support, loosening the locknut.

✓ Arrange the Ear cavity, AJ-034 for IEC R318, AJ-035 for NBS 9A or AJ-036 for BRAUN, on the Artificial Ear. Assemble the acoustic impedance AJ-060[4] for CS2036 or AJ-063[4] for CS2040 on the cavity of the Calibrator. The acoustic impedance must be handled with care and only by edge.

[3] Push in and pull out quickly creates high-pressure variation inside the cavity and can damage measuring microphones or Calibrators.

[4] Take care at AJ-060/063. Remember that the impedance curve of the Ear cavity is relative to the correct value of this acoustic impedance.

✓ Lay the Artificial Ear, with microphone inserted in, on the acoustic impedance; press and release it a little bit. Please, take care both devices must be concentric.

✓ Press **Continue** button or **F6** Function Key.

At the bottom of the screen, there are the following buttons:

IEC R318	Displays on **Graphic Response** window the acceptance mask for AJ-034 cavity
NBS 9A	Displays on **Graphic Response** window the acceptance mask for AJ-035 cavity
BRAUN	Displays on **Graphic Response** window the acceptance mask for AJ-036 cavity
Cal. Check	Displays on **Graphic Response** window an acceptance mask to verify the microphone linearity. Inserting the microphone into the Calibrator cavity, like explained in the **Linearization** or **Sensitivity (1KHz)** Test, without acoustic impedance, and perform the **Ear Check** Test; the microphone response must remains inside the mask limits (± 0,2dB – see **Results Table**). Otherwise, repeat the **Linearization** Test and later on, without modification microphone position, the **Ear Check** Test.

The System starts to check from 200Hz and goes on automatically to 4KHz.

⊗ If the error message "Out of mask" appears, check if the acoustic impedance used is correctly placed and it is not damaged or dirty; then, repeat the test.
All levels must be within ± 1dB from the response shown on the calibration chart, supplied with the acoustic cavity. Otherwise, send the cavity to CS laboratory for cleaning and recalibration.

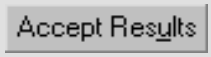
✓ At the end of Test performing, rearrange correctly all the Head's parts (AC-3002, AC-3004, microphone, etc.).

When, in **Linearization** or **Sensitivity (1KHz)** Test, the measurement error is not greater than ± 3dB, is possible to save the value in the System memory and also in the AC-3005 Amplifier Unit memory.
At the bottom of the window, according to test performed, there are the following buttons:

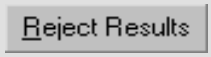
Accept	Accept the calibration data obtained from test (Idle when a measure error is encountered)
Force	Accept the calibration data when the measure is out of tolerance (measure error greater than ± 3dB) but stable
F7 Repeat	Repeat the last calibration test executed
F8 Exit	Exit from calibration procedure
F10 Print Results	Print the results of last test performed

Once the results are accepted, appears the **Acoustic Calibration** window again. At the bottom of it there are the following buttons:

Displays the calibration test results in the **Graphic Response Window**, **Verdict Window** and **Results Table**.
In the **Verdict Window** is possible to accept or discard the results of every single test in the calibration session. Click on the check box on the left side of test name and press the **Discard** button or **Accept** button to reject or accept the calibration data.



Accept all the calibration data collected in the current session and exit from the procedure



Reject all calibration data collected in the current session and exit from the procedure

After this last action, the Artificial Ear calibration session is terminated.

12.3.3 Artificial Mouth Calibration

These procedures allow having an electrical signal to drive the AC-3003 Artificial Mouth such as at the MRP[5] each spectrum component has a level fixed in advance[6].

It is necessary to have already memorized the Artificial Ear calibration data.

The environmental characteristics have large influence on the acoustic field around the Mouth. Reflecting parallel walls, instruments and Operator too could change the acoustic field. For that it's necessary to take care at these indications:

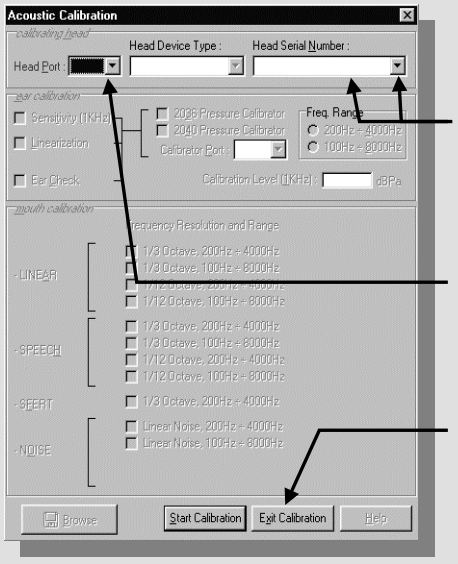
- Use, as much as possible, the indications written in § 2.2.2, for System positioning on the workbench. In that conditions the Artificial Mouth can be calibrated in a place without reflections.
- Calibrate directly on the workbench. Any reflection or distortion of the field is compensated. After calibration, don't change the position of Artificial Head or any object around, to not modify the field distortions that have been compensated.

✓ Set CS8030 System in Stand By mode (see § 4.1) and connect AC-3 Artificial Head to the desired Din connector by the X109-2 cable.

✓ Select **Calibration** Menu from the **Main Menu**.

✓ Appears the **Acoustic Calibration** window. Select the Din port which is connected the Artificial Head to calibrate.
*Otherwise, is possible to select the Head serial number in the list and automatically will appear, in the **Head Port** and **Device Type** box, the corresponding data.*

✓ Select or insert, in the **Head Serial Number** box, the Artificial Head serial number. If the Head has never been calibrated with the System in use or its calibration data have never been imported, is needed to insert the serial number manually (24 numbers at maximum), or search it on a Floppy Disk where, with another System, have been already stored its calibration data. For this function, use the **Browse** button that appears on the window after selecting a Din port. A dialog box will be shown. Select the "AC-3 Artificial Head" folder. In the list, open the folder with name corresponding to the Head's serial number that is connected to the System, and select the "Calibration.def" file. From this point a new calibration session starts.



Select or insert the Artificial Head serial number

Selection of Din port which is connected the Artificial Head to calibrate

Exit from **Acoustic Calibration** window

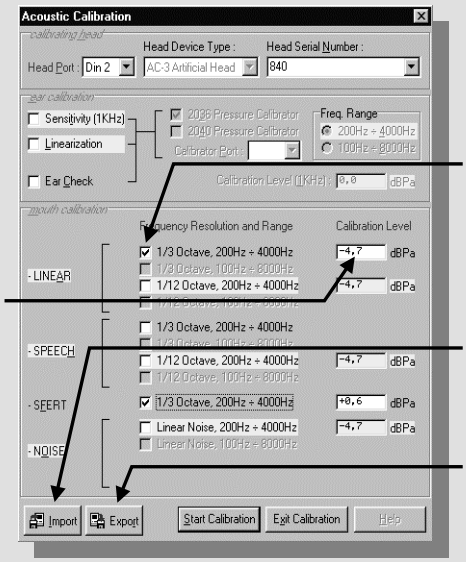
[5] MRP = Mouth Reference Point.

[6] For 1/3 and 1/12 octave calibration; for "noise" calibration only the total level is controlled.

ⓘ If the System already has, for the Artificial Head under test, some valid calibration data, they are highlighted with yellow color.

It is possible to select any of the available tests that are described in the following pages. It is possible also, to set the **Calibration Level** (range –34,5dB$_{Pa}$ to +13,8dB$_{Pa}$) for each test; it represents the RMS pressure value to reach after the calibration procedure, in the MRP.
Otherwise, for a first execution of the calibration procedure with new Artificial Head, please follow, in the order, the steps below:

Calibration uses the same microphone of the Artificial Ear (calibrated as indicated at § 12.3.2).



Calibration Level setting

Calibration Tests selection

Import the calibration data from Floppy Disk

Export on Floppy Disk the calibration data

For a correct valuation of the DUT frequency response, the standards require that the measures must be performed with 100÷8000Hz bandwidth and 1/12 octave resolution.
Use 1/3 octave measure in noisy place mainly (i.e. production division), because it's less affected from environmental noise.
For Loudness Rating and OREM Test, the System always uses the measured value at 1/3 octave only.

ⓘ During test performing, is possible to show the results opening the **Results Table** window placed on Desktop. Messages, at the bottom of this window, will inform the operator if the System has detected a measure error or if the test is inside the acceptance limits.

✓ Arrange the AC-3003 Artificial Mouth on the Artificial Head, in according to the used standard.

✓ Click on **Start Calibration** button. On screen the instructions to correctly arrange all parts involved in the procedure are shown.

Following, all the tests for the Artificial Mouth calibration are described. If more than one Test are selected, the System performs them in the shown order.

1) Linear

Artificial Mouth calibration procedure to obtain in the MRP, a constant pressure level for all the spectrum frequencies. Such pressure level must be measured in according to Appendix 1-Tab.1 and Tab.2. Take care at the modal position of the Artificial Mouth, during calibration and use.

Signal obtained can be used in the following standards with these restrictions:

- UIT-T series	Loudness Rating and Response
- BSI 6317	Loudness Rating and Response
- IEEE 269-661	Loudness Rating and Response
- OREM-A	Response
- DIN44013(OREM-B)	Response
- OREM-CH	OREM and Response
- AUSTRALIA	Loudness Rating and Response

✓ Arrange on the Artificial Mouth the AJ-042 support to define the lip plane.

✓ Pull out the AC-3002 Artificial Ear from the back of AC-3004 support, loosening the locknut. Unscrew and pull out from back the 1/4" microphone.

✓ Insert the microphone slowly into the AJ-042 support and arrange all on the Mouth.

✓ Press **Continue** button or **F6** Function Key.

The System measures the difference between actual RMS pressure value, generated by the Mouth, and the set value (**Calibration Level**) at first. The value is shown, with reverse sign, in the **Pressure Offset** box on the **Results Table**. In the **Graphic Response** window is displayed the difference between the measured response and the ideal one.

⊗ If the error message "Out of Pressure Offset range" appears, is necessary to adjust 'm' trimmer, on the AC-3005 Amplifier Unit, until the measured value will be inside the acceptance limits (± 3dB). Please refer to § 12.4.4 - Trimming.

✓ If there are no measure errors, press **Continue** or **F6** Function Key.

The System performs a second and third measure automatically, calibrating the Mouth emission for a linear frequencies spectrum and minimizing the Pressure Offset value.

✓ At the end of Test performing, rearrange correctly all the Head's parts (AC-3002, AC-3004, microphone, etc.).

---

2) Speech

Artificial Mouth calibration procedure to obtain in the MRP, for all the spectrum frequencies, a pressure level equalization in according to Tab.1/pag.50-CCITT. Such pressure level must be measured in according to Appendix 1-Tab.1 and Tab.2.

Signal obtained can be used in the following standards with these restrictions:

- UIT-T series	Loudness Rating and Response
- IEEE 269-661	Loudness Rating and Response
- AUSTRALIA	Loudness Rating and Response for carbon microphones

✓ Arrange on the Artificial Mouth the AJ-042 support to define the lip plane.

- ✓ Pull out the AC-3002 Artificial Ear from the back of AC-3004 support, loosening the locknut. Carefully, Unscrew and pull out from back the 1/4" microphone.

- ✓ Insert the microphone slowly into the AJ-042 support and arrange all on the Mouth.

- ✓ Press **Continue** button or **F6** Function Key.

  The System measures the difference between actual RMS pressure value, generated by the Mouth, and the set value (**Calibration Level**) at first. The value is shown, with reverse sign, in the **Pressure Offset** box on the **Results Table**. In the **Graphic Response** window is displayed the difference between the measured response and the ideal one.

  ⊗ If the error message "Out of Pressure Offset range" appears, is necessary to adjust 'm' trimmer, on the AC-3005 Amplifier Unit, until the measured value will be inside the acceptance limits (± 3dB). Please refer to § 12.4.4 - Trimming.

- ✓ If there are no measure errors, press **Continue** or **F6** Function Key.

  The System performs a second and third measure automatically, calibrating the Mouth emission for a linear frequencies spectrum and minimizing the Pressure Offset value.

- ✓ At the end of Test performing, rearrange correctly all the Head's parts (AC-3002, AC-3004, microphone, etc.).

---

3) <u>SFERT</u>

Artificial Mouth calibration procedure to obtain in the MRP, a constant pressure level for all the spectrum frequencies. Such pressure level must be measured in according to Appendix 1-Tab.1 and Tab.2, using a microphone assembled with SFERT reflector.

Signal obtained can be used in the following standards with these restrictions:
- OREM-A OREM
- DIN44013(OREM-B) OREM

- ✓ Pull out the AC-3002 Artificial Ear from the back of AC-3004 support, loosening the locknut. Carefully, Unscrew and pull out from back the 1/4" microphone.

- ✓ Assemble the AJ-044 SFERT reflector on the microphone and arrange all on the Mouth.

- ✓ Press **Continue** button or **F6** Function Key.

  Is performed the Artificial Mouth calibration as for **Linear** or **Speech** Test.

---

4) <u>Noise</u>

Calibration procedure of Artificial Mouth that uses noise emission with spectrum equal to the frequency band and constant amplitude. This calibration allows the correct execution of RMS Tests that use noise as stimulus.

- ✓ Arrange on the Artificial Mouth the AJ-042 support to define the lip plane.

- ✓ Pull out the AC-3002 Artificial Ear from the back of AC-3004 support, loosening the locknut. Carefully, Unscrew and pull out from back the 1/4" microphone.

✓ Insert the microphone slowly into the AJ-042 support and arrange all on the Mouth.

✓ Press **Continue** button or **F6** Function Key.

The System measures the difference between actual RMS pressure value, generated by the Mouth, and the set value (**Calibration Level**) at first. The value is shown, with reverse sign, in the **Pressure Offset** box on the **Results Table**. In the **Graphic Response** window is displayed the difference between the measured response and the ideal one.

⊗ If the error message "Out of Pressure Offset range" appears, is necessary to adjust 'm' trimmer, on the AC-3005 Amplifier Unit, until the measured value will be inside the acceptance limits (± 3dB). Please refer to § 12.4.4 - Trimming.

✓ If there are no measure errors, press **Continue** or **F6** Function Key.

The System performs sequentially a second and third measurement, calibrating, between one measure and the other, the Mouth emission at all the spectrum frequencies. It also tries to minimize the Pressure Offset value.

✓ At the end of Test performing, rearrange correctly all the Head's parts (AC-3002, AC-3004, microphone, etc.).

If the error is not greater than ± 3dB, is possible to store the measured value in the System memory. The buttons description and associated operations are the same for the Artificial Ear calibration procedure (see § 12.3.2).

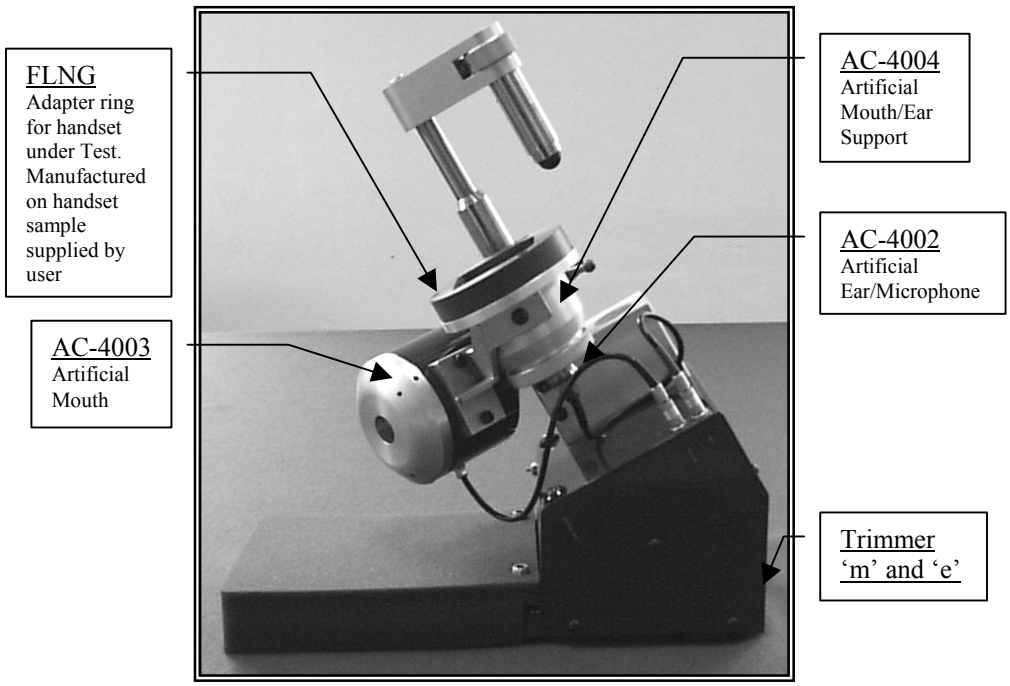
12.4 AC-4 Artificial Head Calibration

12.4.1 Test set needed

Electro-acoustical calibration needs of a test set with accuracy one order higher then AC-4 Artificial Head characteristics.

Different calibration methods are foreseen in according to different rules, particularly for AC-4003 Artificial Mouth. For parameters and methods see Appendix 1 – Tab.1&2.

AC-4 Head main parts



Ear Calibration

The Ear calibration needs the same instruments listed in the paragraph § 12.3.1- Ear section.

Mouth Calibration

Mouth Calibration methods (see Appendix 1-Tab.1&2), are different for:

- Weighting of test signal.
- Position and type of measuring microphone.

In the following table, are shown the tools and measuring instruments needed in according to the signal type used for calibration.

tab.12.4.1

Signal Type	**Instruments**	**Notes**
Linear & Speech[7]	CS8030 System	Calibrated
	AJ-042	Support for calibration microphone
	AC-4002	Artificial Ear/Microphone for AC-4 Head
SFERT[8]	CS8030 System	Calibrated
	AJ-044	SFERT Reflector
	AC-4002	Artificial Ear/Microphone for AC-4 Head

[7] Calibration methods for Artificial Mouth used in UIT-T, BSI, IEEE standard

[8] Calibration methods for Artificial Mouth used in OREM-A, DIN44013 (OREM-B) standard

12.4.2 Artificial Ear Calibration

To check an AC-4 Artificial Head, a calibrated CS8030 System is needed (see § 11).

The following procedures allow checking and eventually correcting, the sensitivity, frequency response linearity of AC-4002 Artificial Ear microphone and checking for Ear cavity (AJ-034, AJ-035, AJ-036).

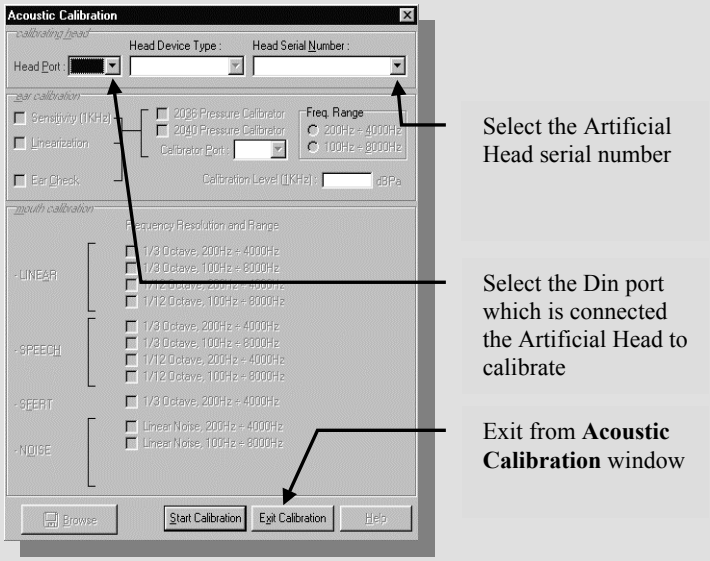
✓ Set CS8030 System in Stand By mode (see § 4.1) and connect AC-4 Artificial Head to the desired Din connector by the X109-2 cable.

✓ Select the **Calibration** Menu from **Main Menu**.

✓ Appears the **Acoustic Calibration** window. Select the Din port which is connected the Artificial Head to calibrate.
*Otherwise, is possible to select the Head serial number in the list and automatically will appear, in the **Head Port** and **Device Type** box, the corresponding data.*

✓ In the **Head Serial Number** box will shown the Artificial Head serial number. If the Head has never been calibrated with the System in use or its calibration data have never been imported, is needed to search them on a Floppy Disk where, with another System, have been already stored. For this function, use the **Browse** button that appears on the window after selecting a Din port. A dialog box will be shown. Select the "AC-4 Artificial Head" folder. In the list, open the folder with name corresponding to the Head's serial number that is connected to the System, and select the "Calibration.def" file. In the Din combo box, you can select **import** or **export** also (to import/export AC-4 calibration data without connecting AC-4 Test Head to the System).

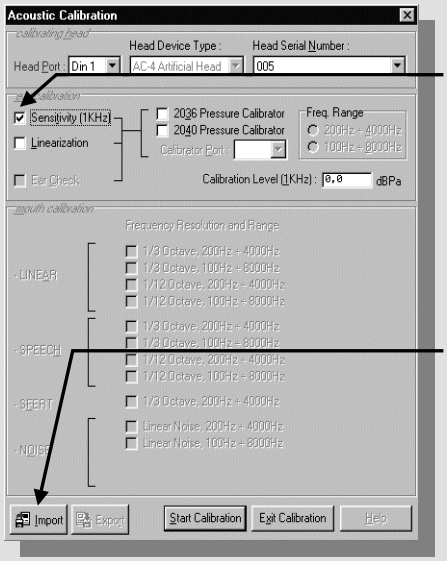
From this point a new calibration session starts.



ⓘ If the System already has, for the Artificial Head under test, some valid calibration data, they are highlighted with yellow color.

It is possible to select any of the available tests that are described in the following pages.
Otherwise, for a first execution of the calibration procedure with new Artificial Head, please follow, in the order, the steps below:

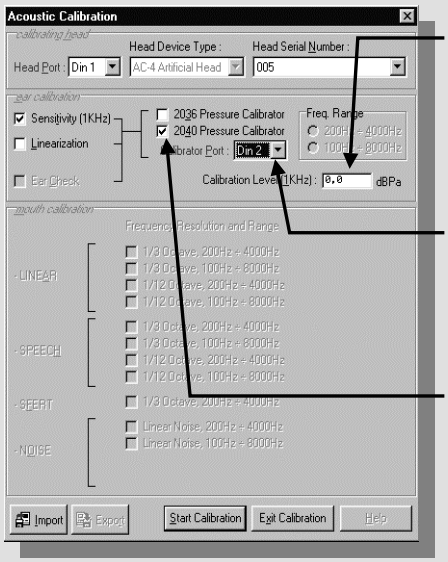
✓ Select, in the **Ear Calibration** section, the **Sensitivity (1KHz)** Test, now available. It is the calibration procedure for 1000Hz sensitivity of measuring microphone.



Selection of **Sensitivity (1KHz)** Test

Import the calibration data, from Floppy Disk, for the Artificial Head under Test (if there are).

✓ Select the electro-acoustical Calibrator that is used in the procedure. Specify the model, the Din port which is connected to, by the X109-2 cable, and eventually the corrective value for **Calibration Level (1KHz)**, in the range of -34,5 ÷ 13,8dB$_{Pa}$, that is used to compensate the difference between Calibrator real emission and the reference value of 94dB$_{SPL}$. If it is used an external Calibrator (mod. B&K4230 or B&K4231) and only the **Sensitivity (1KHz)** Test will be execute, no selections are needed. Set the working frequency range in the **Freq. Range** section.

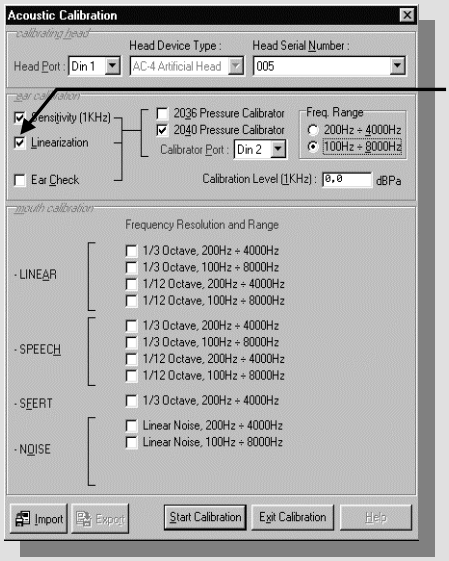


Calibration Level (1KHz) setting

Din Port which is connected the selected Calibrator

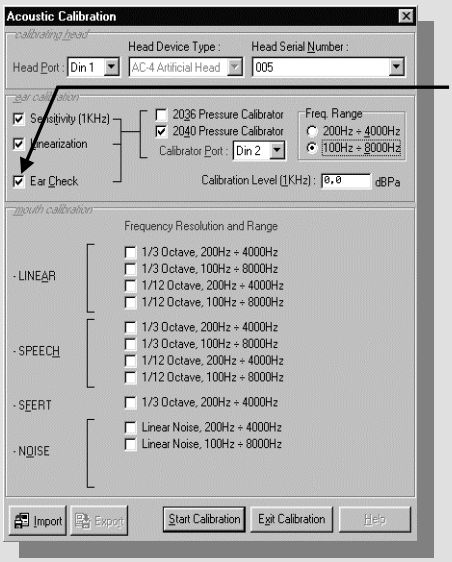
Selection of electro-acoustical Calibrator used

✓ Select, always in the **Ear Calibration** section, the **Linearization** Test, now available. It consists in the linearization procedure of frequency response for the measuring microphone between 200 and 4000Hz, using the Calibrator CS2036, or between 100 and 8000Hz, using the Calibrator CS2040.



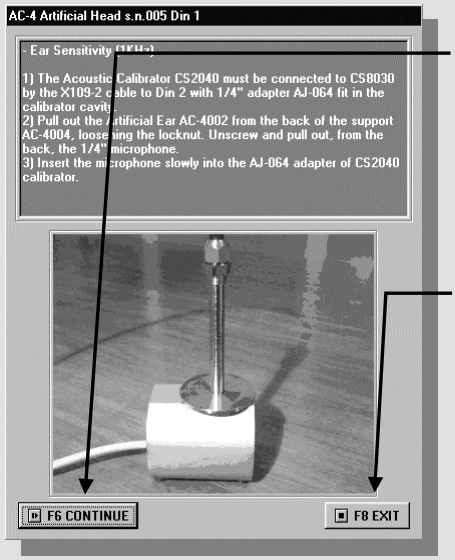
Selection of **Linearization** Test

✓ Select, always in the **Ear Calibration** section, the **Ear Check** Test. It consists in the check procedure for acoustic impedance of Artificial Ear, that is the Ear cavity used (i.e. AJ-034 for IEC R318). This test is necessary when the complex cavity may be dirty or broken.



Selection of **Ear Check** Test

✓ Click on **Start Calibration** button to start the calibration procedure. CS8030 System shows the operations to correctly arrange all parts involved in the procedure.


AC-4 Artificial Head s.n.005 Din 1
1) The Acoustic Calibrator CS2040 must be connected to CS8030 by the X109-2 cable to Din 2 with 1/4" adapter AJ-064 fit in the calibrator cavity
2) Pull out the Artificial Ear AC-4002 from the back of the support AC-4004, loosening the locknut. Unscrew and pull out, from the back, the 1/4" microphone.
3) Insert the microphone slowly into the AJ-064 adapter of CS2040 calibrator.
F6 CONTINUE
F8 EXIT
Test execution
Exit from calibration procedure

ⓘ Closing the procedure is possible to save all the calibration data of the Artificial Head under test, already collected in the current session. In the dialog box that is shown after pressing the **Exit** button or **F8** Function Key, selecting **Yes**, will be saved all the calibration data collected in the previous tests eventually performed in the current calibration procedure.
Selecting **No** will be deleted from the System memory, all the calibration data collected in the current calibration procedure.
Selecting **Cancel**, the System comes back to the procedure without execute any action.

ⓘ During test performing, is possible to show the results opening the **Results Table** window placed on Desktop. Messages, at the bottom of this window, will inform the operator if the System has detected a measure error or if the test is inside the acceptance limits.

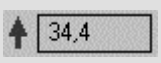
⊗ If the error message "Noise or calibrator problems" appears, be sure that microphone under test is correctly inserted into the Calibrator and also that is selected the right Din port; if the message still appears, exit from procedure and restart the test.

⊗ If the error message "Acoustic Noise" appears, means that the System has detected a quick variation of the measured value; this variation must be more than ± 0,1dB in a time period of about 100ms.
Be sure that the microphone under test is correctly inserted into the Calibrator and the workbench has no vibrations during the measure; if the message still appears, exit from procedure and restart the test.

The System shows with symbols, near measures, the error type:

Not constant value (acceptance range: ± 0,1dB for a time period of about 100ms).

Value under low limit



Value over high limit

Following, are described all the tests for the Artificial Ear calibration.

1) Sensitivity (1KHz) Test

✓ Arrange the CS2036 or CS2040 Calibrator, connected to the System, with AJ-061 (CS2036) or AJ-064 (CS2040) 1/4" microphones adapters, inserted in the calibration cavity.
Otherwise, arrange the Calibrator B&K4230 or B&K4231 with 1/4" B&K adapter.

✓ Pull up AC-4004 support, loosening the block lever. Pull out the AC-4002 Artificial Ear from bottom, loosening the locknut. Unscrew and pull out from back the 1/4" microphone and insert it slowly[9] into the adapter hole of Calibrator CS2036, CS2040 or B&K4230/1 used.

✓ Press **Continue** button or **F6** Function Key.

The Calibrator supplies $94dB_{SPL}$ at 1KHz. The Artificial Head's microphone detects it with a little imprecision, due to own characteristics. The System saves this value to correct all the measures that will be performed with the Artificial Head under test.

⊗ If the error message "Noise or calibrator problems" appears in the **Results Table**, after checking the electrical and acoustical connections, adjust the 'e' trimmer, on back side of AC-4 Artificial Head, to set the measured value to $0dB_{Pa}$.

✓ At the end of Test performing, rearrange correctly all the Head's parts (AC-4002, AC-4004, microphone, etc.).

---

2) Linearization Test

✓ Arrange the CS2036 or CS2040 Calibrator, connected to the System, with AJ-061 (CS2036) or AJ-064 (CS2040) 1/4" microphones adapters, inserted in the calibration cavity.

✓ Pull up AC-4004 support, loosening the block lever. Pull out the AC-4002 Artificial Ear from bottom, loosening the locknut. Unscrew and pull out from back the 1/4" microphone and insert it slowly[9] into the adapter hole of Calibrator CS2036, CS2040 or B&K4230/1 used.

✓ Press **Continue** button or **F6** Function Key.

The System starts to explore all the frequencies from 200Hz to 4000Hz, if CS2036 is used, or 100Hz to 8000Hz if CS2040 is used (ISO 266 - 1/3 octave); for each one the dB value, normalized to 1000Hz, is given.

✓ At the end of Test performing, rearrange correctly all the Head's parts (AC-4002, AC-4004, microphone, etc.).

---

3) Ear Check Test

✓ Pull up AC-4004 support, loosening the block lever. Pull out the AC-4002 Artificial Ear from bottom, loosening the locknut.

✓ Arrange the Ear cavity, AJ-034 for IEC R318, AJ-035 for NBS 9A or AJ-036 for BRAUN, on the Artificial Ear. Assemble the acoustic impedance AJ-060[10] for CS2036 or AJ-063[10] for CS2040 on the Calibrator's cavity. The acoustic impedance must be handled with care and only by edge.

[9] Push in and pull out quickly creates high-pressure variation inside the cavity and can damage measuring microphones or Calibrators.

✓ Lay the Artificial Ear, with microphone inserted in, on the acoustic impedance; press and release it a little bit. Please, take care both devices must be concentric.

✓ Press **Continue** button or **F6** Function Key.

At the bottom of the screen, there are the following buttons:

IEC R318	Displays on **Graphic Response** window the acceptance mask for AJ-034 cavity
NBS 9A	Displays on **Graphic Response** window the acceptance mask for AJ-035 cavity
BRAUN	Displays on **Graphic Response** window the acceptance mask for AJ-036 cavity
Cal. Check	Displays on **Graphic Response** window an acceptance mask to verify the microphone linearity. Inserting the microphone into the Calibrator cavity, like explained in the **Linearization** or **Sensitivity (1KHz)** Test, without acoustic impedance, and performing the **Ear Check** Test, the microphone response must remains inside the mask limits (± 0,2dB – see **Results Table**). Otherwise, repeat the **Linearization** Test and later on, without modification microphone position, the **Ear Check** Test.

The System starts to check from 100 or 200Hz and goes on automatically to 4 or 8KHz, depends which Calibrator is used.

⊗ If the error message "Out of mask" appears, check if the acoustic impedance used is correctly placed and it is not damaged or dirty; then, repeat the test.
All levels must be within ± 1dB from the response shown on the calibration chart, supplied with the acoustic cavity. Otherwise, send the cavity to CS laboratory for cleaning and recalibration.

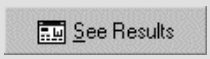
✓ At the end of Test performing, rearrange correctly all the Head's parts (AC-4002, AC-4004, microphone, etc.).

When, in **Linearization** or **Sensitivity (1KHz)** Test, the measurement error is not greater than ± 3dB, is possible to save the value in the System memory.
At the bottom of the window, according to test performed, there are the following buttons:

Accept	Accept the calibration data obtained from test (Idle when a measure error is encountered)
Force	Accept the calibration data when the measure is out of tolerance (measure error greater than ± 3dB) but stable
F7 Repeat	Repeat the last calibration test executed
F8 Exit	Exit from calibration procedure
F10 Print Results	Print the results of last test performed

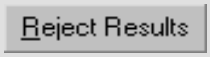
[10] Take care at AJ-060/063. Remember that the impedance curve of the Ear cavity is relative to the correct value of this acoustic impedance.

Once the results are accepted, appears the **Acoustic Calibration** window again. At the bottom of it there are the following buttons:



Displays the calibration test results in the **Graphic Response Window**, **Verdict Window** and **Results Table**.
In the **Verdict Window** is possible to accept or discard the results of every single test in the calibration session. Click on the check box on the left side of test name and press the **Discard** button or **Accept** button to reject or accept the calibration data.

Accept all the calibration data collected in the current session and exit from the procedure



Reject all calibration data collected in the current session and exit from the procedure

After this last action, the Artificial Ear calibration session is terminated.

12.4.3 Artificial Mouth Calibration

These procedures allow having an electrical signal to drive the AC-4003 Artificial Mouth such as at the MRP[11] each spectrum component has a level fixed in advance[12].

It is necessary to have already memorized the Artificial Ear calibration data.

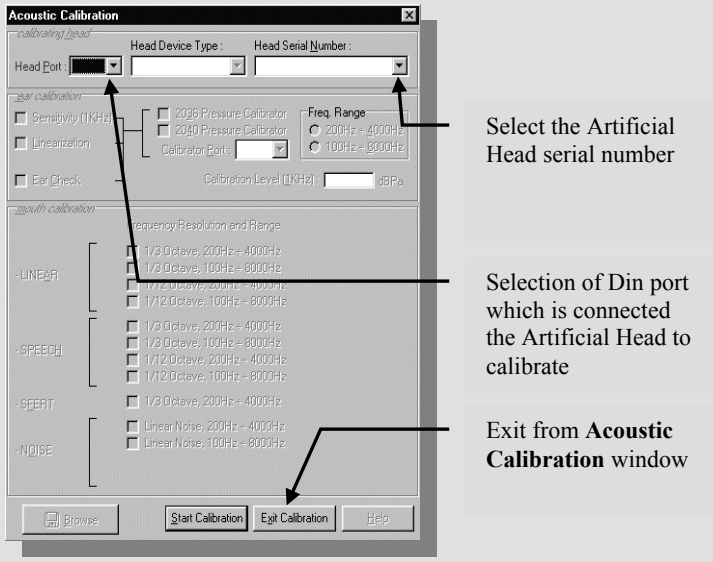
See § 12.3.3 for recommendation about minimizing the environmental noise.

✓ Set CS8030 System in Stand By mode (see § 4.1) and connect AC-4 Artificial Head to the desired Din connector by the X109-2 cable.

✓ Select **Calibration** Menu from the **Main Menu**.

✓ Appears the **Acoustic Calibration** window. Select the Din port which is connected the Artificial Head to calibrate.
*Otherwise, is possible to select the Head serial number in the list and automatically will appear, in the **Head Port** and **Device Type** box, the corresponding data.*

✓ In the **Head Serial Number** box will shown the Artificial Head serial number. If the Head has never been calibrated with the System in use or its calibration data have never been imported, is needed to search them on a Floppy Disk where, with another System, have been already stored. For this function, use the **Browse** button that appears on the window after selecting a Din port. A dialog box will be shown. Select the "AC-4 Artificial Head" folder. In the list, open the folder with name corresponding to the Head's serial number that is connected to the System, and select the "Calibration.def" file. In the Din combo box, you can select **import** or **export** also (to import/export AC-4 calibration data without connecting AC-4 Test Head to the System).
From this point a new calibration session starts.



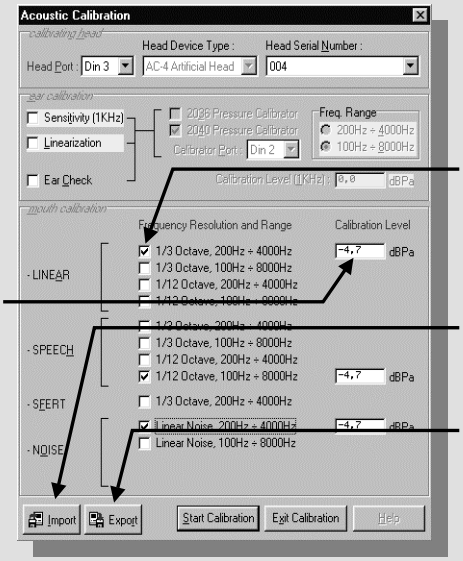
ⓘ If the System already has, for the Artificial Head under test, some valid calibration data, they are highlighted with yellow color.

[11] MRP = Mouth Reference Point.

[12] For 1/3 and 1/12 octave calibration; for "noise" calibration only the total level is controlled.

It is possible to select any of the available tests that are described in the following pages. It is possible also, to set the **Calibration Level** (range –34,5dB$_{Pa}$ to +13,8dB$_{Pa}$) for each test; it represents the RMS pressure value to reach after the calibration procedure, in the MRP.
Otherwise, for a first execution of the calibration procedure with new Artificial Head, please follow, in the order, the steps below:

Calibration uses the same microphone of the Artificial Ear (calibrated as indicated at § 12.4.2).



Calibration Level setting

Calibration Tests selection

Import the calibration data, from Floppy Disk

Export on Floppy Disk the calibration data

For a correct valuation of the DUT frequency response, the standards require that the measures must be performed with 100÷8000Hz bandwidth and 1/12 octave resolution.
Use 1/3 octave measure in noisy place mainly (i.e. production division), because it's less affected from environmental noise.
For Loudness Rating and OREM Test, the System always uses the measured value at 1/3 octave only.

ⓘ During test performing, is possible to show the results opening the **Results Table** window placed on Desktop. Messages, at the bottom of this window, will inform the operator if the System has detected a measure error or if the test is inside the acceptance limits.

✓ Arrange the AC-4003 Artificial Mouth on the Artificial Head, in according to the used standard.

✓ Click on **Start Calibration** button. On screen the instructions to correctly arrange all parts involved in the procedure are shown.

Following, all the tests for the Artificial Mouth calibration are described. System performs them in the shown order.

1) Linear

Artificial Mouth calibration procedure to obtain in the MRP a constant pressure level for all the spectrum frequencies. Such pressure level must be measured in according to Appendix 1-Tab.1 and Tab.2. Take care at the modal position of the Artificial Mouth, during calibration and use.

Signal obtained can be used in the following standards with these restrictions:

- UIT-T series	Loudness Rating and Response
- BSI 6317	Loudness Rating and Response
- IEEE 269-661	Loudness Rating and Response
- OREM-A	Response
- DIN44013(OREM-B)	Response
- OREM-CH	OREM and Response
- AUSTRALIA	Loudness Rating and Response

✓ Arrange on the Artificial Mouth the AJ-042 support to define the lip plane.

✓ Pull up AC-4004 support, loosening the block lever. Pull out the AC-4002 Artificial Ear from bottom, loosening the locknut. Unscrew and pull out from back the 1/4" microphone.

✓ Insert the microphone slowly into the AJ-042 support and arrange all on the Mouth.

✓ Press **Continue** or **F6** Function Key.

The System measures the difference between actual RMS pressure value, generated by the Mouth, and the set value (**Calibration Level**) at first. The value is shown, with reverse sign, in the **Pressure Offset** box on the **Results Table**. In the **Graphic Response** window is displayed the difference between the measured response and the ideal one.

⊗ If the error message "Out of Pressure Offset range" appears, is necessary to adjust 'm' trimmer, on the rear side of the Artificial Head, until the measured value will be inside the acceptance limits (± 3dB). Please refer to § 12.4.4 - Trimming.

✓ If there are no measure errors, press **Continue** or **F6** Function Key.

The System performs a second and third measure automatically, calibrating the Mouth emission for a linear frequencies spectrum and minimizing the Pressure Offset value.

✓ At the end of Test performing, rearrange correctly all the Head's parts (AC-4002, AC-4004, microphone, etc.).

---

2) Speech

Artificial Mouth calibration procedure to obtain in the MRP, for all the spectrum frequencies, a pressure level equalization in according to Tab.1/pag.50-CCITT. Such pressure level must be measured in according to Appendix 1-Tab.1 and Tab.2.

Signal obtained can be used in the following standards with these restrictions:

- UIT-T series	Loudness Rating and Response
- IEEE 269-661	Loudness Rating and Response
- AUSTRALIA	Loudness Rating and Response for carbon microphones

✓ Arrange on the Artificial Mouth the AJ-042 support to define the lip plane.

✓ Pull up AC-4004 support, loosening the block lever. Pull out the AC-4002 Artificial Ear from bottom, loosening the locknut. Unscrew and pull out from back the 1/4" microphone.

- ✓ Insert the microphone slowly into the AJ-042 support and arrange all on the Mouth.
- ✓ Press **Continue** or **F6** Function Key.

  The System measures the difference between actual RMS pressure value, generated by the Mouth, and the set value (**Calibration Level**) at first. The value is shown, with reverse sign, in the **Pressure Offset** box on the **Results Table**. In the **Graphic Response** window is displayed the difference between the measured response and the ideal one.

  ⊗ If the error message "Out of Pressure Offset range" appears, is necessary to adjust 'm' trimmer, on the rear side of the Artificial Head, until the measured value will be inside the acceptance limits (± 3dB). Please refer to § 12.4.4 - Trimming.
- ✓ If there are no measure errors, press **Continue** or **F6** Function Key.

  The System performs a second and third measure automatically, calibrating the Mouth emission for a linear frequencies spectrum and minimizing the Pressure Offset value.
- ✓ At the end of Test performing, rearrange correctly all the Head's parts (AC-4002, AC-4004, microphone, etc.).

---

3) <u>SFERT</u>

Artificial Mouth calibration procedure to obtain in the MRP, a constant pressure level for all the spectrum frequencies. Such pressure level must be measured in according to Appendix 1-Tab.1 and Tab.2, using a microphone assembled with SFERT reflector.

Signal obtained can be used in the following standards with these restrictions:
- OREM-A OREM
- DIN44013(OREM-B) OREM

- ✓ Pull up AC-4004 support, loosening the block lever. Pull out the AC-4002 Artificial Ear from bottom, loosening the locknut. Carefully, Unscrew and pull out from back the 1/4" microphone.
- ✓ Assemble the AJ-044 SFERT reflector on the microphone and arrange all on the Mouth.
- ✓ Press **Continue** or **F6** Function Key.

  Is performed the Artificial Mouth calibration as for **Linear** or **Speech** Test.

---

4) <u>Noise</u>

Calibration procedure of Artificial Mouth that uses noise emission with spectrum equal to the frequency band and constant amplitude. This calibration allows the correct execution of RMS Tests that use noise as stimulus.

- ✓ Arrange on the Artificial Mouth the AJ-042 support to define the lip plane.
- ✓ Pull up AC-4004 support, loosening the block lever. Pull out the AC-4002 Artificial Ear from bottom, loosening the locknut. Carefully, Unscrew and pull out from back the 1/4" microphone.
- ✓ Insert the microphone slowly into the AJ-042 support and arrange all on the Mouth.

✓ Press **Continue** or **F6** Function Key.

The System measures the difference between actual RMS pressure value, generated by the Mouth, and the set value (**Calibration Level**) at first. The value is shown, with reverse sign, in the **Pressure Offset** box on the **Results Table**. In the **Graphic Response** window is displayed the difference between the measured response and the ideal one.

⊗ If the error message "Out of Pressure Offset range" appears, is necessary to adjust 'm' trimmer, on the rear side of the Artificial Head, until the measured value will be inside the acceptance limits (± 3dB). Please refer to § 12.4.4 - Trimming.

✓ If there are no measure errors, press **Continue** or **F6** Function Key.

The System performs a second and third measure automatically, calibrating the Mouth emission for a linear frequencies spectrum and minimizing the Pressure Offset value.

✓ At the end of Test performing, rearrange correctly all the Head's parts (AC-4002, AC-4004, microphone, etc.).

If the error is not greater than ± 3dB, is possible to store the measured value in the System memory. The buttons description and associated operations are the same for the Artificial Ear calibration procedure (see § 12.4.2).

12.5 Trimming Procedure

Trimming operation is necessary when, due to Artificial Mouth's characteristics, not all the calibration curves fall within the acceptance limits.

✓ Set CS8030 System in Stand By mode (see § 4.1) and connect the Artificial Head to the desired Din connector by the X109-2 cable.

✓ Select **Artificial Head Trimming** in the **Calibration** Menu.

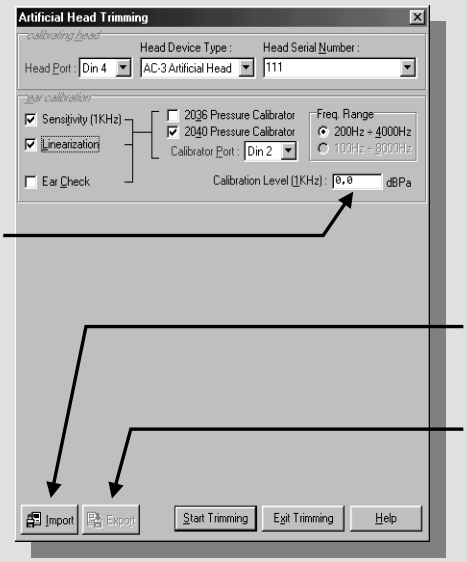
✓ The **Artificial Head Trimming** window appears. Select the Din port which is connected the Artificial Head to calibrate.
*Otherwise, is possible to select the Head serial number in the **Head Serial Number** list and automatically will appear, in the **Head Port** and **Device Type** box, the corresponding data.*

ⓘ If the Artificial Head has never been calibrated with the System in use or its calibration data have never been imported, is needed to search them on a Floppy Disk where, with another System, have been already stored. For this function, use the **Browse** button that appears on the window after selecting a Din port. A dialog box will be shown. Select the "Acoustic\AC-4 Artificial Head" folder. In the list, open the folder with name corresponding to the Head's serial number that is connected to the System, and select the "Calibration.def" file. From this point a new calibration session starts.

✓ Select one, all or none of the available tests and set the **Calibration Level (1KHz)** (programmable from $-34{,}5dB_{Pa}$ to $+13{,}8dB_{Pa}$). If selected, tests will be performed as desribed at § 12.4.2 / 12.3.2, according to the type of Artificial Head connected.

ⓘ It is necessary to have the calibration data for the Artificial Ear to perform the trimming procedure. If the System already has, for the Artificial Head under test, some valid calibration data, they are highlighted with yellow color.

✓ Click on **Start Trimming** to start the calibration procedure. The instructions to correctly arrange all parts involved in the procedure are shown on screen.



Calibration Level (1KHz) setting

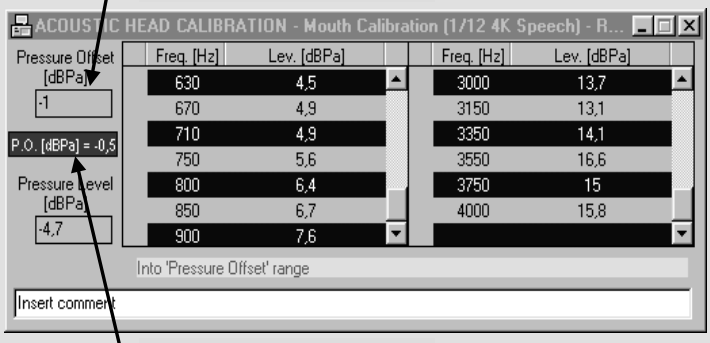
Import the calibration data, from Floppy Disk

Export on Floppy Disk the calibration data

✓ Press **F6** or **Continue** button to proceed through the tests. If **Auto F6 Continue** box has been selected, the tests will be automatically performed until the last one.

✓ After saving all the Artificial Mouth characteristic curves, the user has to adjust the 'm' trimmer on the Artificial Head, to obtain the Pressure Offset value, shown in the red box on the **Result Table**.

Pressure Offset value, to be adjusted by 'm' trimmer



Target of Pressure Offset value, requested by the System

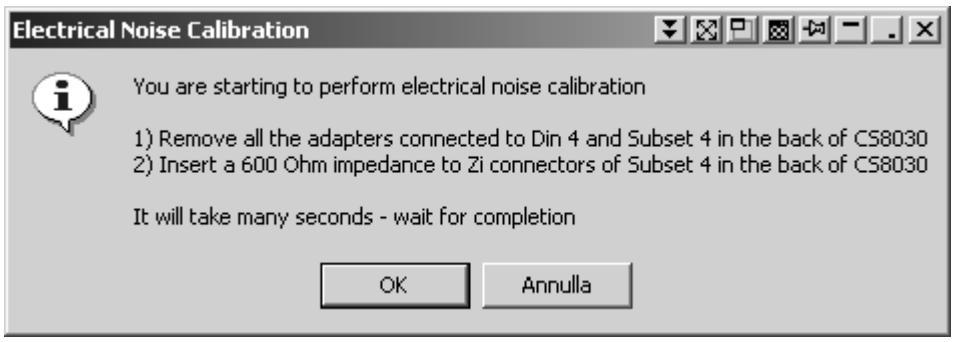
✓ After reaching the target Pressure Offset value, press **F6** or **Continue** to end.

✓ Then repeat all the Artificial Mouth calibration procedure, <u>without change the 'm' trimmer position</u>. If the Pressure Offset measured value is still out the acceptance limit (± 3dB), please contact CS Customer Service.

12.6 Electrical Noise Calibration

Electrical Noise Calibration operation detects background CS8030 noise and then improves measurement accuracy of Acoustic TE Noise Test.

Select **Electrical Noise Calibration** in the **Calibration** Menu. On the screen appears the following window:


Electrical Noise Calibration
You are starting to perform electrical noise calibration
1) Remove all the adapters connected to Din 4 and Subset 4 in the back of CS8030
2) Insert a 600 Ohm impedance to Zi connectors of Subset 4 in the back of CS8030
It will take many seconds - wait for completion
OK
Annulla

Follow instructions and wait for Calibration:

At completion appears the following window:

So in this way Electrical Noise Calibration datas for sending and receiving are updated in CS8030.

Appendix 1

Specifications on the Acoustic Measurements

CS8030 System is a multinational test system so is able to satisfy various Standards for Objective Acoustic Measurements, and it is particularly qualified for measurements type Loudness Rating (CCITT-P-series).

A1.1 Introduction to quantities, measurement units and references

In the speech measurements are used electric and acoustic quantities.

For making easy the comparison of homogeneous data coming from various sources it is established the use improper measurement units, the dBm and the dBspl, for defining acceptance values and limits, respectively for electric and acoustic results.

Electrical Reference:

- As 0 dBm is understood an electric reference level which produce 1mW on 600 Ω, i.e.:

$$\text{Vref} = \sqrt{1\,\text{mW} \times 600\,\text{Ohm}} = 0{,}774596\text{V}$$

- Reference for CS8030 has been considered, for all electro-acoustic measurements, the voltage of 1 Vrms; for that the electrical levels are indicated in dBv.
  As 0 dBv is understood an electric level of 1Vrms.
  i.e. 0 dBm can be expressed as:

$$0\ \text{dBm} = 20 \log \frac{0{,}774596V}{1V} = -2{,}21848\ \text{dBv}$$

Acoustic References:

- For 0 dBspl is understood the acoustic level of reference pressure, i.e.

$$0\ \text{dBspl} = 2 \times 10^{-5}\ \text{N/m}^2$$

where

1 Pa (1) [1]= 94 dBspl =1 N/m^2= 10 μBar

- Likewise for electrical level, in CS8030 System, a pressure of 1Pa has been considered as reference level for all electro-acoustic measurements; for that the acoustic levels are expressed in dBpa.
  For 0 dBpa is understood an acoustic level equal to 1Pa.
  For example the pressure of 89,3 dBspl, used for Loudness Rating measurements, can be expressed as:

89,3 dBspl= (89,3 dBspl -94 dBspl)=-4,7 dBpa

For example the pressure of 94,6 dBspl, used for OREM A and B measurements, can be expressed as:

94,6 dBspl= (94,6 dBspl -94 dBspl)=+0,6 dBpa

A1.2 Conversion factor

CS8030 needs to operate an acoustic-electric conversion factor defined as:

0 dBpa= 94 dBspl = 266 mVrms = -11,5 dBv

Each device must be calibrated for this transfer function.
i.e. microphones for Artificial Ear and for Ringer must have an output voltage of 266mV for a pressure level equal to 1Pa.

A1.3 Differences between Standards

Tables 1 and 2 show the main differences existing between the most used Standards.

CCITT-P SERIES	Blue Book Vol.V° - 1988 (European Standard) (For Italy - CEI 103.5/7)
BSI 6317-1982	(British Standard)
IEEE	Std 266:1983 & Std 661:1979 (USA Standard)
AUSTRALIA	TS 004 - 1992 (Australian Standard)
OREM-A	(B&K3356 method)
OREM-B	DIN 44013 (old German Standard)
OREM-CH	SR 784.103.12/2.1/1 (Swiss Standard)

Tab.1

the differences between the Standards are relative to:

1)	Artificial Ear - conformation and volume of the coupler with the handset
2)	modal position of Artificial Mouth/Ear group
3)	reference electric voltage on line for reception measurements
4)	integration index and computation method
5)	Artificial Mouth output - weighting and measurement method – calibration

Tab.2

[1] **Pa** = Pascal, measurement unit of acoustic pressure equal to 10 μBar

CS8030 System can satisfy these five points in the following ways:

1) Couplers available at present:

AJ 034	(IEC R318)	CCITTP64; BS6317; IEEE; OREM-CH; AUSTRALIA
AJ 035	(NBS9A)-6 cm^3	OREM-A
AJ 036	(BRAUN)-4 cm^3	OREM-B - DIN 44013

2) Normally are possible three modal positions with Artificial Head AC-3/AC-4:

LRGP	Loudness Rating Guard-ring Position	CCITT-P series; BS6317; OREM-CH; AUSTRALIA
REF	Reference	OREM-A; OREM-B DIN 44013
AEN		IEEE Std 266/661

3) Line signal level can be changed introducing into programming the wished value.

4) Out pressure level from the Artificial Mouth can be changed introducing into programming the wished acoustic value (see § 12). Calibration method is important for the yield and for linearity in use.

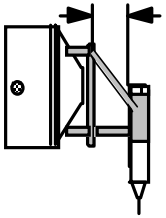
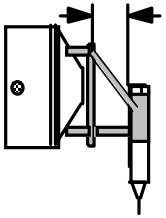
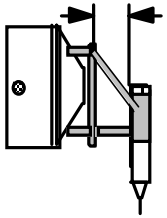
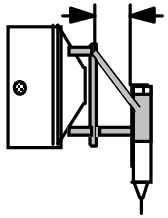
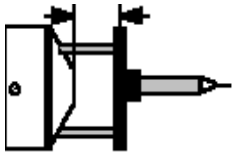
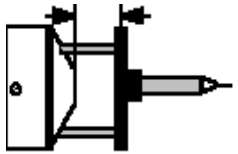
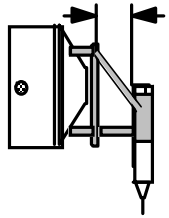
5) The choice of measurement method defines the integration index and the computation method.

CS8030 - Appendix 1 - Table 1

STANDARD	CCITT -P SERIES Blue Book Vol.V° - 1988 (Italian Standard) (CEI 103-5/7)	BSI 6317-1982 (British Standard)	IEEE Std 266:1983 Std 661:1979 (USA Standard)	AUSTRALIA (TS 004 - 1992)	OREM -A (B&K3356 method)	OREM-B DIN 44013 (German Standard)	OREM-CH SR 784.103.12/2.1/1 (Swiss Standard)
Recommended method	Loudness Rating	Loudness Rating	Loudness Rating	Australia	OREM-A	OREM-B	OREM-CH
Coupler	**AJ-034** Artif.Ear of 2.5cm^3 IEC -R318-	**AJ-034** Artif.Ear of 2.5cm^3 IEC -R318-	**AJ-034** Artif.Ear of 2.5cm^3 IEC -R318-	**AJ-034** Artif.Ear of 2.5 cm^3 - IEC -R318-	**AJ-035** Artif.Ear of 6cm^3 NBS-9A	**AJ-036** Artif.Ear of 4cm^3 BRAUN	**AJ-034** Artif.Ear of 2.5cm^3 IEC -R318-
Modal position	**LRGP** (Loudness Rating Guard-ring Position)	**LRGP** (Loudness Rating Guard-ring Position)	**AEN**	**LRGP** (Loudness Rating Guard-ring Position)	**REF** (Reference)	**REF** (Reference)	**LRGP** (Loudness Rating Guard-ring Position)
Ear leackage simulation	ST sealed RX unsealed	sealed	N.D.	sealed	N.D.	N.D.	N.D.
Test signal and equalization	Composite Linear or Speech Frequencies ISO 266-1975 - 200÷4000 Hz	Composite Linear Frequencies ISO 266-1975 - 200÷4000 Hz	Composite Linear or Speech Frequencies ISO 266-1975 - 200÷4000 Hz	Composite Linear or Speech Frequencies ISO 266-1975 - 200÷4000 Hz	Composite Linear or SFERT Frequencies ISO 266-1975 - 200÷4000 Hz	Composite Linear or SFERT Frequencies ISO-266-1975 - 200÷4000 Hz	Composite Linear Frequencies ISO 266-1975 - 200÷4000 Hz
Integration index Transmit Receive Side-Tone	m= 0.175 0.175 0.225	m= 0.175 0.175 0.225	m= 0.2275 0.2275 0.2275	m= 0.2976 0.2976 0.225	m= 0.3 0.3 0.3	m= 0.3 0.3 0.3	m= RMS method 1 1 1
Reference level Acoustic Electric	1Pascal 1Volt	1Pascal 1Volt	1Pascal 1mVolt	1 Pascal 1Volt	1.07Pa =+0.6dBPa 1.07Pa =94.6dB$_{spl}$ 285mV	1.07Pa =+0.6dBPa 1.07Pa =94.6dB$_{spl}$ 285mV	1.78Pa =+5dBPa 1.78Pa =99dB$_{spl}$ 285mV
Level of Stimulus Acoustic Electric(loaded)	-4.7dB re 1Pa =89.3 dB$_{spl}$ -18dB re 1V =126mV/600Ω	-4.7 (-5) dB[1] re 1Pa =89.3 (89)dB$_{spl}$ -16 dB re 1V =158mV/600Ω	-6dB re 1Pa = 88dB$_{spl}$ -16dB re 1V =158mV/600Ω	-4.7 dB re 1Pa = 89.3dB$_{spl}$ -18 dB re 1V =126 mV /600Ω	+0.6dB re 1Pa =94.6dB$_{spl}$ -10.9dB re 1V =285mV/600Ω	+0.6dB re 1Pa =94.6dB$_{spl}$ -10.9dB re 1V =285mV/600Ω	-10dB re 1Pa =84dB$_{spl}$ -10.9dB re 1V =285mV/600Ω

[1] BSI 6317 foreseen only for sidetone -5 dBPa = 89 dBspl

CS8030 - Appendix 1 - Table 2

STANDARD	**CCITT -P SERIES** **Blue Book** **Vol.V° - 1988** **(Italian Standard)**	**BSI 6317-1982** **(British Standard)**	**IEEE** **Std 266:1983** **Std 661:1979** **(USA Standard)**	**AUSTRALIA** **(TS 004 - 1992)**	**OREM-A** **(B&K3356 method)**	**OREM-B** **DIN 44013** **(German Standard)**	**OREM-CH** **SR** **784.103.12/2.1/1** **(Swiss Standard)**
Artificial Mouth Calibration	distance 25 mm 	distance 25 mm 	distance 25 mm 	distance 25 mm 	distance 33.5+10 mm 	distance 33.5+10 mm 	distance 25 mm 
Calibration Microphone *ext:*	1/2 " type B&K 4134	1/2 " type B&K 4134	1/2 " type B&K 4133 or: B&K4134 with correction for free field	1/2 " type B&K 4134	- 1" type B&K 4144 for SFERT calibration *(equivalent measur.).* - 1/2" type B&K 4134 for linear calibration (reference to CCITT-P SERIES)*(response evaluation)*	- 1" type B&K 4144 for SFERT calibration *(equivalent measur.).* - 1/2" type B&K 4134 for linear calibration (reference to CCITT-P SERIES)*(response evaluation)*	1/2 " type B&K 4134
Calibration Microphone *int:*	Microphone of the Artificial Ear with support **AJ-042**	Microphone of the Artificial Ear with support **AJ-042**	Microphone of the Artificial Ear with support **AJ-042**	Microphone of the Artificial Ear with support **AJ-042**	- Microphone of the Artificial Ear with SFERT reflector **AJ-044** *(equivalent measur.).* - Microphone of the Artificial Ear with support **AJ-042** *(response evaluation)*	- Microphone of the Artificial Ear with SFERT reflector **AJ-044** *(equivalent measur.).* - Microphone of the Artificial Ear with support **AJ-042** *(response evaluation)*	Microphone of the Artificial Ear with support **AJ-042**
Calibration method	Stimulus pressure is linearized.	Stimulus pressure is linearized and detected its nonlinearity at +10dB and -10dB.	Stimulus pressure is linearized.	Stimulus pressure is linearized.	Stimulus pressure is linearized.	Stimulus pressure is linearized.	Stimulus pressure is linearized.

Appendix 2

Communication Protocol for GPIB IEEE-488.2 port

Language as SCPI (Standard Commands for Programmable Instruments)

Commands Summary

System Commands

commands	action	answer back
***CLS**	Clear of response buffer. Reset of absolute results and preceding test results.	None.
RESTART	Restart the CS8030, like the restart button. Controller must use '**findlstn**' command after this command.	None.
***IDN?**	Request of device identification.	Returns the identification string: "**CS8030 – Test System for Telephonometry – S.N. xxxx**"

Configuration Commands

commands	action	answer back
CONFigure?: "program-path": pr-index	Loads the test program specified from "program-path" string. It will assume the index defined by "pr-index". The "pr-index" value must included between 1 and 3. Program-path must be relative to the default program directory of CS8030 (…\Programs), and the file-name must have the **.PRG** suffix and must not have backslash (\) as first character.	- "**program [program-path] – [pr-index]**" if correctly configured; - "**program [program-path or pr-index] still in execution**" if the program identified through the parameters is running; - "**program [program-path] not found**" if the program is not present; - "**program [program-path] already addressed**"
CONFigure?	Request of CS8030 configuration.	"**program 1: [program-path], program 2: [program-path], program 3: [program-path]**" . If some pr-index results not configured, the associated program-path assumes the name "**none**".
MEASure?: pr-index.test-no	Executes the test "test.no" inside the loaded test program defined by "pr-index". Resets of preceding test results, doesn't reset absolute results and forces test attribute to 'AUTO' before execution.	- "**[pr-index] – n° [test-no]**" if OK; - "**Invalid test**" if test-no exceeds the program length; - "**Excluded test**" if test is 'EXCLUDED'; - "**Program [pr-index] – n° [test-no] still in execution**" if the test-no is already running. - "**Invalid program**" if pr-index value is not included between 1 and 3.

READ?	Request of the results of the preceding executed test.	If previous "MEAS?" command succeeds, returns the fundamental results "**[1];[2];[3];n°[4];[5]**" where: 1) Loudness Rating or Echo Return Loss or Harmonic Distortion; 2) Mask Margin or Total Distortion; 3) Mask Margin (for Distortion Tests only); 4) Test Index; 5) Test Verdict (Passed/Failed). If previous "MEAS?" command fails, returns error messages: - "**Relative test without a compatible previous absolute test**"; - "**Relative test without a compatible previous absolute test - Frequency range/resolution mismatch**"; - "**Missing Artificial Head calibration parameters**"; - "**Missing AC-4 Artificial Head on Din [din number]**"; - "**AC-4 Artificial Head on Din [din number] doesn't respond to command**"; - "**Handset retainer of AC-4 Artificial Head on Din [din number] doesn't complete movement**". - "**AC-4 Artificial Head on Din [din number] problem or malfunction**".

Appendix 3

Error Messages

A3.1 Error and Warning Messages

CS8030 System's error and warning messages are described in the following table:

Message	Cause	Solution
Disk Error – There is no disk in drive A. Insert the disk and then try again	Try to perform any I/O data operation (i.e. Test Program import/export) without inserting a Floppy Disk in the Disk Drive.	Insert a Floppy Disk in the Disk Drive on which write or read data.
Disk error – The disk is write protected. Remove the write-protection or use another disk	Try to save on a write-protected Floppy Disk.	Push down the write-protect tab on the Floppy Disk.
Program editing error – Invalid selection. Select a valid Test	Try to erase, copy or cut a Test on an empty Test Program.	Add a valid Test in the active Test Program.
Acoustic calibration warning – Incomplete Calibration Form	Try to start the calibration procedure (i.e. for AC-4 Head), without inserting all requested or correct data in the Calibration Form (i.e. Acoustic Calibrator not selected for Linearization Test).	Insert correct values for requested Calibration data.
Program execution error – 'Return' without 'GoSub'	Set a Return Control for one Test in the Program, without a GoSub Control above.	Delete Return Control or add, above it, a GoSub Control in the Test Program.
Calibration parameters error – Missing Calibration parameters on Din *x* for the Artificial Head AC-*x* s.n.*xxx*	Set, in the **Din Port** window of **Environment Options**, an Artificial Head, but its calibration data are missing.	Set another Artificial Head or calibrate the selected one (see § 12).

Acoustic calibration – Exit Calibration. Do You want to keep the steps done?	Exit from Calibration procedure.	Pressing Yes, all the calibration data collected in the current session, will be saved. Pressing No, all calibration data collected will be erased from System's memory.
Calibration parameters error – Missing Calibration parameters on Din *x*. You must calibrate the Artificial Head or load the parameters from disk	Set in the Calibration Form, an Artificial Head and try to load its calibration parameters from Floppy Disk (Import).	Set another Artificial Head, calibrate the selected one (see § 12) or insert a Floppy Disk with corresponding calibration data.
Artificial Head error – Artificial Head SN*xxx* is already connected to another DIN. Choose another Serial Number	Wrong serial number selection on the **Din Port** tab in the **Environment Options**; the Artificial Head selected is already connected to the System.	Select another serial number.
Data file warning – C:*xxx* data file found. Data file will be appended	Open a Collection or Recording already created. New data will be appended at the end of the existing data.	
Program file – Do you want to overwrite the modified program?	After modifying a Test Program, select **Save** function.	To overwrite new changes on the Test Program press **OK**, otherwise select **Save As...** command in the **File** Menu.
Program file – C:*xxx.PRG*. Do you want to save this modified program?	After modifying a Test Program, select **Close** function before to save it.	To overwrite new changes on the Test Program press **Yes.** Pressing **No**, Test Program will be closed without save the changes done.
Data program error – xxx.PRG Data program is changed, check and retry	The active Test Program xxx.PRG has been modified during Collection or Recording execution.	Restore the Test Program's start conditions erasing the changes made.
Test execution error – Test in execution. Exit test execution and retry	Try to end a Collection during Test execution.	Press **F8** Function Key, the corresponding button at the bottom of the screen or select **EXIT Program** command in the **Execution** Menu.
Data file warning – Data file not found. Make a new data file	Try to open a not existent Collection or Recording, linked to the active Test Program, by pressing **Open linked Collection/Recording** button.	Create a linked Collection or Recording for the active Test Program (see § 10.2).

Data file warning – C:*xxx.COL* Data file is no more existing. Make a new data file	Open by **Open linked Collection/Recording** button, a Collection or Recording linked to the active Test Program that has been already removed.	Create a new linked Collection or Recording for the active Test Program (see § 10.2).
Serial port error – AC-4 Artificial Head on DIN*x* problem or malfunction. Check or contact technical support	Perform a Test by an AC-4 Artificial Head that is not correctly connected to DIN*x* or is not functioning.	Check connections and retry to perform the Test; if the problem persists, contact technical support.
Calibration parameters error – Missing Artificial Head calibration parameters on DIN*x*. Do you want to exclude the test n°*x*?	Try to execute an Acoustic Test without the respective calibration parameters for the Artificial Head used.	Change the Test parameter setting or, including the requested parameters, calibrate the Artificial Head used.
Program File error – Program file not found. Check and Retry	Try to load a Test Program from floppy disk and the System doesn't find it.	Check that the floppy contains the required Test Program and it is correctly inserted, then retry.